Sick with burnout

clarified through electronic diaries

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Ziek van burnout

verhelderd door elektronische dagboeken

(met een samenvatting in het Nederlands)

Proefschrift

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Contents

Chapter 1

Introduction

Burnout is a fairly recent but common work-related health problem (Shirom, 2005; Van der Klink & Van Dijk, 2003). One out of five employees suffers from mild burnout symptoms and 1 out of 25 employees suffers from severe symptoms (Honkonen et al., 2006; Houtman, Schaufeli, & Taris, 2000; Kant, Jansen, Amelsvoort, Mohren, & Swaen, 2004). It emerged as a societal problem in the mid 1970s and subsequently became a subject of scientific research. Burnout is mainly caused by chronic stress at work (Maslach, Schaufeli, & Leiter, 2001; Schaufeli & Enzmann, 1998) which induces a process of psychological erosion (Hobfoll, 2001). The result is a state of severe exhaustion, with a co-occurring cynical attitude towards work and the belief that one's professional accomplishments have failed (Maslach et al., 2001). Burnout research has mainly concentrated on milder expressions of the syndrome in relatively healthy employees who are still working (Schaufeli, Bakker, Hoogduin, Schaap, & Kladler, 2001). Yet, when burnout symptoms have emerged they seem resistant to change and the risk of sick leave increases. It is, therefore, surprising that the most severe cases on extended sick leave have been neglected in burnout research (Schaufeli et al., 2001). Consequently, the exact characteristics of the severe form of burnout, i.e. clinical burnout, are still badly understood and require further exploration. Moreover, the diagnostic classification of burnout is an issue of controversy, which springs from the fact that concise diagnostics of burnout lacks empirical basis. Effective treatment is also a pressing issue, which depends in part on diagnostic clarity. This thesis seeks to extend our understanding of the symptoms of clinically burned-out employees to increase the knowledge on this severely burned-out group and to enhance diagnostic clarity. To obtain a detailed account of patients' symptoms we employed an electronic diary according to the Experience Sampling Method (ESM) (Csikszentmihalyi & Larson, 1987; Delespaul, 1995) instead of using retrospective questionnaires. ESM provides more reliable and detailed information in the natural context of burned-out individuals (Bolger, Davis, & Rafaeli, 2003). A more extensive introduction is provided below. We will first define the burnout syndrome and describe its appearance ('The burnout syndrome'). Next, we will display the extent of the societal problem that is formed by burnout ('The burnout syndrome in society'). Subsequently, we will show that clinical burnout research faces several challenges ('The burnout syndrome in research'). Finally, we will present the aim and outline of the current thesis ('The current thesis').

THE BURNOUT SYNDROME

The core concept

Burnout is characterized by five core aspects (Maslach & Schaufeli, 1993): Most prominent is (1) a predominance of symptoms of fatigue, such as mental or emotional exhaustion and tiredness. Chronic fatigue may be accompanied by (2) atypical physical distress symptoms, like pains or dizziness. The burnout symptoms are (3) work related. This basically indicates that symptoms are caused by chronic stress at work, including, for example, enduring high work loads, continuous time pressure, lack of decision latitude or lack of supervisory support (Maslach et al., 2001; Schaufeli & Enzmann, 1998). (4) Burnout affects 'normal' individuals with no pre-morbid psychopathology. And finally, (5) burned-out employees experience a decreased effectiveness and impaired work performance due to negative attitudes and behaviors.

A common way of classifying burnout is the three-dimensional definition, derived from the three subscales of the Maslach Burnout Inventory (MBI) (Maslach & Jackson, 1986). This burnout questionnaire is most frequently used in research (Schaufeli & Enzmann, 1998). The scales comprise (1) exhaustion due to work, accompanied by either (2) a cynical attitude towards work, and/or (3) the belief that one's professional efficacy has failed. Though there is some debate about the other two dimensions, exhaustion is considered indisputably as the hallmark of burnout (Cox, Tisserand, & Taris, 2005; Kristensen, Borritz, Villadsen, & Christensen, 2005). Exhaustion is conceived as the severe and chronic form of acute fatigue in healthy individuals, that no longer responds to normal periods of rest (Maslach & Schaufeli, 1993; Meijman & Schaufeli, 1996; Winwood, Winefield, Dawson, & Lushington, 2005). This state of static fatigue is thought to be caused by a long process of energy erosion. According to the theory of the conservation of resources (COR) burnout occurs when resources (time, energy) are invested in work but no resources are gained, resulting in, for instance, missed opportunities and increasing compensatory investment of times for leisure and recovery in work (Hobfoll, 2001). COR theory holds that the initial loss of resources increases the costs, thereby setting off a spiral of losses. This spiral seems to result in an 'empty energy tank', the case of severe burnout. Though exhaustion includes mental, emotional and physical fatigue (Maslach & Schaufeli, 1993), the MBI-exhaustion scale is a one-dimensional scale which encompasses all different kinds of experiences of fatigue (Schaufeli & Van Dierendonck, 2000). This corresponds to the fact that, in practice, individuals are unable to characterize their fatigue as being either mental or physical (Shen, Barbera, & Shapiro, 2006).

Though exhaustion is (at first) experienced before, during and after a workday, cynicism more clearly reflects the relationship between burnout and work-related content. The enduring stress causes the employee to distance him/herself more and more from the job he/she used to be actively involved in. For example, a psychiatric nurse may speak of the 'psychosis in room number 2' instead of directly referring to the patient as Mrs. X. In other words, cynicism is a dysfunctional coping strategy to protect oneself for further resource losses at work (Schaufeli & Taris, 2005; Taris, Le Blanc, Schaufeli, & Schreurs, 2005). The third dimension, (a lack of) professional efficacy, refers to the individual's impression that his accomplishments at work are of a lower quality than before. Professional efficacy seems to be a more independent state than exhaustion and cynicism (Maslach et al., 2001). In fact, the relationship to the other dimensions is only weak (Lee & Ashforth, 1996). Yet the lack of relationship of professional efficacy with exhaustion and cynicism might be due to an artifact, namely that of negative wording in the first two scales as opposed to positive wording in the professional efficacy scale (Schaufeli, Leiter, & Maslach, in preparation).

Several researchers reduce burnout to a single dimension, namely fatigue (Christensen, Feldman Barrett, Bliss-Moreau, Lebo, & Kashub, 2003; Shirom, 2003). Others, amongst whom the authors of the MBI, firmly discourage such an approach (Maslach et al., 2001; Schaufeli & Taris, 2005). They argue that reducing burnout to exhaustion removes the burnout specific work-relatedness as well as the aspect of withdrawal. Reducing burnout to mere exhaustion makes it hard to differentiate it from chronic fatigue or the chronic fatigue syndrome (CFS). Little research has been done to actually compare burnout and CFS sufferers. A pioneering study showed that both groups differ in causal attributions; where CFS patients attributed their condition primarily to physical causes, burned-out individuals had stronger psychological attributions accompanied by more psychological distress (Huibers et al., 2003). However, the debate about the three-dimensionality and distinctness of burnout is on-going (Kristensen et al., 2005; Schaufeli & Taris, 2005). We agree, however, with the authors of the MBI, that burnout is more than exhaustion alone, and consider it to be a multidimensional concept, that is distinct from 'general' chronic fatigue or CFS due to its work-relatedness and the aspect of withdrawal.

Physical and psychological side symptoms

Many psychological and physical side symptoms accompany the burnout syndrome. A thorough review of the literature identified over a hundred concurring symptoms (Schaufeli & Enzmann, 1998). Due to their a-specific nature, Maslach and Schaufeli (2003) address this matter by referring to 'the potential occurrence of atypical physical distress symptoms'. No psychological distress symptoms are mentioned

even though burnout is thought to affect 'normal individuals with no pre-morbid psychopathology'.

This thesis draws attention to two particular side-symptoms. The first of these is disturbed sleep. As stated previously exhaustion constitutes burnouts' core symptom. Moreover, burned-out individuals no longer seem to profit from normal periods of rest (Shirom, Melamed, Toker, Berliner, & Shapira, 2005). Exhaustion endures despite nightly rest, weekends, vacations or even sick leave. It is however questionable whether the nightly periods of rest qualify as being 'normal'. Sleep problems tend to develop when stress is experienced on the job (Akerstedt, Fredlund, Gillberg, & Jansson, 2002; Linton, 2004). Indeed, disturbed sleep is reported by employees with elevated burnout scores (Melamed et al., 1999; Soderstrom, Ekstedt, Akerstedt, Nilsson, & Axelsson, 2004), and seems even worse in severely burned-out individuals (Ekstedt et al., 2006). Disturbed sleep may, therefore, sustain or even elicit exhaustion. Consequently, a better understanding of the interaction between burnout and sleep is required (Melamed, Shirom, Toker, Berliner, & Shapira, 2006; Shirom et al., 2005). Literature on sleep disturbances in burnout has, to-date, restricted itself to observational reports.

The second side-symptom that will be examined is depression, a symptom that is often included in burnout research. Depressive symptomatology has a partial overlap with the burnout syndrome. Several studies have concluded that these concepts share on average 25% of their variances (Glass & McKnight, 1996; Schaufeli & Enzmann, 1998). A recent study showed that the association between burnout and depression strengthens when burnout symptoms intensify; 50% of the most severe burned-out employees, as measured by the MBI, suffered from a co-morbid depressive disorder. This was 2.5 times more often than employees experiencing mildly elevated burnout scores (Ahola et al., 2005). Despite the strong relationship, it has been well established that burnout and depression are distinct phenomena (Shirom et al., 2005). Nevertheless, Shirom strongly recommends accounting for the possibility that results in burnout research are due to effects of depression (Shirom, 2005). This is especially relevant in our case, as sleep disturbances are common sign of major depression (American Psychological Association, 1994; WHO, 1993). We will, therefore, take Shirom's recommendation at heart by explicitly examining and addressing the influence of depressive symptoms during our research.

Psychophysiological deregulations

Burnout is thought to be accompanied by physiological deregulations. Noting that burnout is supposed to be the result of chronic stress, most studies on its physiology have focused on the Hypothalamus Pituitary Adrenal axis (HPA-axis) (Raison &

Miller, 2003), the central stress-physiological system for the long-term adaptation of an organism to stress (Cook, 2002; Sapolsky, Romero, & Munck, 2000). The HPA-axis has been associated with hyper-functioning during acute stress (Sapolsky et al., 2000) and depression (Holsboer, 2001), and with hypo-functioning in fatigue (Cleare, 2003) and chronic stress syndromes (Heim, Ehlert, & Hellhammer, 2000). To-date, studies on burnout have produced contradictory results, finding both hyper- and hypo-functioning of the HPA-axis or no deregulations at all (Kudielka, Bellingrath, & Helhammer, 2006; Melamed et al., 2006). Two recent dissertations cast further doubts on the existence of psychophysiological deregulations in burnout (Langelaan, 2007; Mommersteeg, 2006). We therefore conclude that at present physiological deregulations in burnout are questionable, considering that psychophysiological research has produced many inconsistencies.

Summary

Burnout is a work-related syndrome characterized by severe exhaustion and dysfunctional attitudes towards work and one's professional efficacy. The syndrome is accompanied by many atypical physical and psychological side-symptoms. Because the restoration of energy seems disturbed in burnout, it is seems plausible to pay scientific attention to sleep disturbances. Moreover, the close relationship of depression and exhaustion asks for the critical review of findings in burnout research.

Though the burnout concept is fairly well established after several decades of research, the debate about its distinctness from related conditions like chronic fatigue/CFS and depression is still on-going. The inconsistent findings on psychophysiological deregulations in burnout do not provide further clarity on this issue.

THE BURNOUT SYNDROME IN SOCIETY

Prevalence

Recently, three nation wide epidemiological studies conveyed the prevalence of the burnout syndrome (see Table 1). All three studies assessed burnout by means of questionnaires instead of a medical diagnosis, considering that it has not been internationally recognized as a valid medical diagnosis. The first study revealed that 16.4% of the Dutch working population suffers from burnout (Kant et al., 2004). Every year 6.1% new burnout cases emerge. Based on these figures, burnout is estimated to endure for an average of 2.5 years. A second Dutch epidemiological study estimates burnout prevalence to be somewhat higher, at 20.4%. This

epidemiological study differentiated between ‘severe burnout’ and ‘mild burnout’. In severe burnout symptom severity is comparable to that of burned-out employees who receive psychological treatment for their complaints. Severe burnout occurs in 4.0% of the working population, or about 280,000 of the employees of the Dutch labor force (total of ±7 million). An additional 16.4% suffers from mild burnout, i.e. experiences burnout symptoms less frequently, but is at risk for developing severe burnout (Houtman et al., 2000). In Finland a prevalence of 27.5% was found. Mild burnout, defined as experiencing burnout symptoms once a month, occurs in 25.2% of the working population, while 2.4% suffers from severe burnout, experiencing symptoms once a week or daily (Honkonen et al., 2006). Details on how these percentages were obtained are displayed in Table 1.

Burnout prevalence varies with demographic characteristics. Men suffer somewhat more often from burnout than women (Houtman et al., 2000; Kant et al., 2004). Two studies report that burnout increases with age (Ahola et al., 2006; Houtman et al., 2000), while the third reports a higher prevalence among 18 to 25 year olds (Kant et al., 2004). A more consistent finding is that a higher prevalence of burnout is found amongst the lower educated (particularly in women) (Ahola et al., 2006; Kant et al., 2004) and amongst singles (particularly in men) (Ahola et al., 2006; Houtman et al., 2000; Kant et al., 2004). Burnout occurs in many occupational fields but diverges strongly between companies in the same occupational field, and between departments within the same company. Therefore, it has been suggested that profession alone is not a useful indicator for burnout risk (Kant et al., 2004).

The risk of long term sick leave

Several studies show that individuals characterized with high burnout scores are at risk for sick leave (Bekker, Croon, & Bressers, 2005; Borritz, Rugulies, Christensen, Villadsen, & Kristensen, 2006; Toppinen-Tanner, Ojajärvi, Väänänen, Kalimo, & Jäppinen, 2005). The study of Borritz et al. (2006) showed that an increase of one standard deviation on the Copenhagen Burnout Inventory predicted an increase of 21% in sickness absence days per year, while they accounted for many confounding variables. Toppinen-Tanner et al. (2005) showed that high burnout was related to a 25% increase of number of future sick leave absences in an industrial corporation. In the study of Bekker et al. (2005) exhaustion appeared as the main predictor of number of sickness absence days per year. Furthermore, in the Dutch working population, almost 3% suffers from burnout and is on sick leave (Kant et al., 2004).
The exact amount of employees that call in sick for a longer period of time due to burnout symptoms remains unclear because predictive and epidemiological studies do not differentiate between short- and long-term sick leave. There are, however, indirect indications that burnout may lead to long term sick leave. One study, of

Table 1. The prevalence of burnout

Country	*N*	Instrument	Criteria for burnout			Prevalence	Year	Reference
The Netherlands	12,140	MBI	Burnout	E ≥ 2.40, and either C ≥ 2.25 or PE ≤ 3.50	E more than once a month, and either C more than once a month or PE less than once a week	16.4%	2004	(Kant et al., 2004)
The Netherlands	13,436	MBI	Mild burnout or a heightened risk on severe burnout	3.80 > E ≥ 2.20, and either 2.59 > C ≥ 2.20 or PE ≤ 3.66	E more than once a month, and either C more than once a month or PE less than once a week	16.4%	2000	(Houtman et al., 2000)
			Severe burnout	E ≥ 3.80, and either C ≥ 2.59 or PE ≤ 3.75	E several times a month and either C more than once a month or PE less than once a week	4.0%		
Finland	3,368	MBI	Mild burnout	1.50 ≤ (0.4*E + 0.3*C + -0.3*PE) < 3.49	monthly symptoms	25.2%	2006	(Honkonen et al., 2006)
			Severe burnout	(0.4*E + 0.3*C + -0.3*PE) ≥ 3.50	burnout symptoms once a week or daily	2.4%		

Note. MBI = Maslach Burnout Inventory (Maslach & Jackson, 1986). E = MBI exhaustion subscale, C = MBI cynicism subscale, PE = MBI professional efficacy subscale.

fatigue at work - a more broadly defined but burnout-related concept (Kant et al., 2003) - did differentiate between short- and long-term sick leave (Janssen, Kant, Swaen, Janssen, & Schroer, 2003). Fatigue was associated with both short- and long-term sick leave, but the association with long-term sick leave was stronger. Also, 33% of the new disability pensions in the Netherlands are due to psychological problems (Uitvoeringsinstituut Werknemersverzekeringen, 2006), and burnout constitutes the largest part of this group (Houtman et al., 2000).

It is important to note, however, that burnout itself as an accepted reason for sick leave strongly depends on societal agreements. That is, in some countries (like the Netherlands and Sweden) burnout is an officially recognized diagnosis for extended absence, whereas in most other countries it is not (Schaufeli et al., in preparation; Shirom, 2005; Van der Klink, Blonk, Schene, & Van Dijk, 2003).

Resistance to change

Once symptoms have developed, burnout seems resistant to change (Shirom et al., 2005). Symptom levels of employees that continue to work despite burnout (mild burnout) have shown to be stable over time periods up to 8 years (Taris et al., 2005). The stability of clinical burnout, occurring when symptoms lead to sick leave and/or treatment, has been studied far less (Schaufeli et al., 2001). Yet, preliminary evidence suggests that exhaustion decreases within approximately 10 months after sick leave but stabilizes thereafter at an elevated level (Blonk, Brenninkmeijer, Lagerveld, & Houtman, 2006; Mommersteeg, Heijnen, Verbraak, & van Doornen, 2006b; Van der Klink et al., 2003). To-date, neither cognitive behavioral therapy (CBT) nor time-contingent activating intervention appears to promote symptom recovery in clinically burned-out individuals (Blonk et al., 2006). Time-contingent activation means stimulating return to work independently of symptom severity. Sick leave because of burnout also seems hard to battle. A first indication was provided by two studies in which only 50% of the burned-out sample attained a full return to work after 8.5 months of treatment (Mommersteeg, Heijnen et al., 2006b) and 11 months after sick leave (Blonk et al., 2006), respectively. While work resumption seems to be insensitive to CBT (Blonk et al., 2006), time-contingent activation is attaining better results (Blonk et al., 2006; Van der Klink et al., 2003). For example, in one study an activating intervention reached 50% full work resumption within 4 months after sick leave instead of 11, i.e. 7 months sooner than either CBT or no treatment (Blonk et al., 2006). However, still another 50% continued their sick leave after 4 months.

Summary
Mild burnout is a common problem that is affecting the working population and constitutes a risk for the development of more severe symptoms and long-term sick leave. A smaller but considerable group of employees - 2 to 4% - suffers from severe burnout. When severe burnout leads to long-term sick leave, symptom recovery and work resumption is very difficult to attain and occurs only slowly. Therefore, severe burnout constitutes a troubling problem that is costly, both personally and economically. This problem becomes particularly visible and is particularly problematic in countries where burnout is an accepted reason for extended sick leave, like the Netherlands.

THE BURNOUT SYNDROME IN RESEARCH

The healthy worker effect

In several decades the knowledge on mild burnout has extended enormously. After the emergence of burnout in society, organizational psychological research flourished, focusing solely on employees with mild symptoms (Schaufeli & Enzmann, 1998). Even though the psychiatrist Herbert Freudenberger (1974) published some pioneer case studies of severe burnout, this did not spark research in psychiatry or clinical and health psychology. Consequently, most research on burnout has been carried out amongst working employees, neglecting the most severe cases that are either on sick leave or have left their job altogether. Therefore, our knowledge on burnout is hampered by the so-called 'healthy worker effect' (Karasek & Theorell, 1990), i.e. the systematic overrepresentation of working, and thus, relatively healthy employees (Kant et al., 2004; Schaufeli et al., 2001). Fortunately, in recent years, knowledge on clinical burnout has begun to slowly increase. One new investment concerns studies on dysfunction in endocrinology (De Vente, Olff, Van Amsterdam, Kamphuis, & Emmelkamp, 2003; Mommersteeg, Heijnen, Keijsers, Verbraak, & Van Doornen, 2006; Mommersteeg, Heijnen, Verbraak, & Van Doornen, 2006a). But as with psychophysiological research in mild burnout, the results on associations between burnout and endocrinological deregulations have thus far been contradictory. A study on the association of burnout and common infections, however, provided evidence for burnout (mild and severe alike) as a risk factor for common infections in a large heterogeneous population (Mohren et al., 2003). Two other studies established the psychometric properties of the MBI a clinical population (Roelofs, Verbraak, Keijsers, Bruin, & Schmidt, 2005; Schaufeli et al., 2001). The MBI was originally developed to assess mild burnout, but these studies confirmed the three-factor structure of the MBI and the internal consistency of its subscales in a

clinical burnout population. The MBI exhaustion and cynicism scales were able to discriminate between burned out and non-burned out employees, while the ability of the MBI to differentiate burnout from other syndromes was moderate.

Notwithstanding these efforts, there is much ground to be gained. As noted before, the increase of knowledge on severe burnout is of particular concern in countries where its diagnosis is recognized in health care and is an accepted reason for sick leave. In these countries many clinically burned-out individuals seek (and find) burnout treatment. However, since studies on clinical burnout are scarce, clinical practice lacks the empirical underpinning of diagnostics and intervention. To attain an evidence based practice, burnout research should revive the clinical and health psychological perspective.

Consequences of the healthy worker effect

The consequences of the healthy worker effect are manifest in both research and practice. A domain that concerns both research and practice is the diagnostic criteria for burnout. In research, cutoff scores on burnout questionnaires were used until know to discern burnout sufferers (see Table 1). In clinical practice a diagnosis conform medical classification systems is preferred. Though burnout patients are currently being diagnosed in the clinical practice, a consensus has yet to be reached regarding the accompanying criteria. The leading psychiatric classification systems ICD-10 (WHO, 1993) and DSM-IV (American Psychiatric Association, 1994) do not provide specific diagnostic criteria for burnout. The ICD-10 does mention burnout as 'a problem related to life-management difficulty' and describes it as 'a state of vital exhaustion' (code Z73.0) (WHO, 1993). Yet, no criteria are provided to establish the diagnosis. Several propositions have been made to help classify sufferers of the burnout syndrome. The most promising classification has been defined as 'work-related neurasthenia' (ICD-10, code F48.0) (W. B. Schaufeli et al., 2001). 'Work-related neurasthenia' corresponds largely with the five core aspects that Maslach and Schaufeli (Maslach & Schaufeli, 1993) extracted from the different burnout definitions mentioned above (W. B. Schaufeli et al., 2001). Ironically, the original diagnosis of neurasthenia excludes burnout by definition; when the symptoms fitted the original diagnosis of neurasthenia, burnout was 'overruled' as a probable diagnosis (see Appendix I). The DSM-IV does not regard 'neurasthenia' as a separate diagnosis, but includes this fatigue syndrome within the category of 'undifferentiated somatoform disorders' (American Psychiatric Association, 1994; Hickie, Hadzi-Pavlovic, & Ricci, 1997). Alternative diagnostic solutions have been proposed and used in several other countries. In 2005 the Swedish National Board of Health and Welfare added the 'exhaustion syndrome' to the national version of the ICD-10 (code F43.8) (Socialstyrelsen, 2005). In the Netherlands, guidelines for

occupational physicians label the entire continuum from mild to severe burnout as 'work-related adjustment disorders' (Van der Klink et al., 2003). A more extensive description of the different diagnoses are provided in Appendix I, II and III at the end of this chapter.

Research on severe burnout faces several other challenges as a result of the 'healthy worker effect'. We name two of them. First of all, the definition and assessment of burnout is variable across studies. It is originally and most often assessed as a multidimensional and continuous concept by using the MBI (Cox et al., 2005); studies report the values on three different burnout dimensions separately (i.e. exhaustion, cynicism and professional efficacy). The individual is scaled as being more or less severely burned-out. Yet sometimes burnout is considered as the end-stage of a process, thereby defining it as a dichotomous state; an individual is either burned-out or not burned-out. Burnout was treated dichotomously in the epidemiological studies mentioned above, and surely this view is used in occupational medicine (Schaufeli, Leiter, & Maslach, in preparation). Thus, when conducting research with burnout an explicit choice has to be made about approaching burnout either as a continuous or a dichotomous state (Brenninkmeijer & VanYperen, 2003). In clinical or health psychology, the general approach will be dichotomously.

Second, the most common definition in mild burnout research is three dimensional, i.e. exhaustion due to work, cynicism and reduced professional efficacy at work (Maslach et al., 2001). When studying severe burnout in individuals that are no longer working, cynicism and professional efficacy become less relevant. Nevertheless, exhaustion seems to persist even without work (for example, Hoogduin, Schaap, Methorst, Peters van Neyenhof, & Griendt, 2001; Mommersteeg, Heijnen, Verbraak, & Van Doornen, 2006a). This is because exhaustion is considered as the end-stage of an erosion process, and therefore recovery is expected only slowly even after the stress-giving factor has disappeared (i.e. work due to sick leave) (Hobfoll, 2001). Assessing burnout symptoms in individuals on sick leave seems restricted to exhaustion. Note, however, that even if only this symptom is measured burnout cannot be reduced to mere exhaustion (Maslach et al., 2001) (see discussion above).

The electronic diary method

Though the debate on the distinctness of burnout is on-going and tempting to participate in, knowledge on the manifestation of clinical burnout itself is still lacking. Therefore, the first thing to be clarified is the *actual* occurrence of burnout symptoms and their associations when the individual is on extended sick leave at home. Consequently, a research method is needed that fits the aim of the current thesis.

The most common way to assess burnout symptoms is by means of questionnaires. A questionnaire requires that the participant provides an overall estimation of his/her symptom severity in the recent past. To reach this overall estimation cognitive processes are required, such as remembering and integrating past experiences. Unfortunately, individuals are unable to produce a reliable estimate of past experiences yielding retrospection bias. For example, recollection of the past induces the tendency to report more negative emotions and to stay nearer to the scale midpoint (Fahrenberg, Huttner, & Leonart, 2001). Moreover, two studies revealed that chronic pain patients over report pain in retrospective assessment (Stone, Broderick, Shiffman, & Schwartz, 2004; Stone, Schwartz, Broderick, & Shiffman, 2005), because peak pain experiences are remembered best. Fluctuating symptoms like pain and fatigue are particularly prone to retrospection bias (Bolger et al., 2003). Beliefs and attitudes regarding symptoms (Robinson & Clore, 2002) and the current state (Hufford, Shiffman, Paty, & Stone, 2001) further distort truthful retrospective reporting.

Prospective electronic diary monitoring has been proposed as an alternative assessment method to circumvent retrospection bias and thus yield accurate and valid symptom reports. A diary records symptom severity instantly at the moment of occurrence, and within the individual's natural environment (ecological valid). A more reliable overall estimation of symptom severity is obtained when a series of diary records across days or weeks are aggregated, particularly when measuring fluctuating symptoms. A second major advantage of the electronic diary is that it offers the unique opportunity to study within person relationships (Bolger et al., 2003). For example, one might examine whether symptom fluctuations are systematically associated with time of day or with particular situational characteristics. A diary study is therefore prospective and can be compared to longitudinal designs, though the time frame in diary studies is commonly restricted to several days or weeks while longitudinal studies can cover periods up to several years. The Experience Sampling Method (ESM) (Csikszentmihalyi & Larson, 1987) and the comparable Ecological Momentary Assessment (EMA) (Stone & Shiffman, 1994) are refined methods that employ an electronic diary. Electronic diary methods have been successfully used in many areas and have been comprehensively reviewed (Bolger et al., 2003; Hufford et al., 2001; Reis & Gable, 2000). However, to our knowledge, ESM has not been applied in burnout research yet, or clinically burned-out individuals in particular. Due to the momentary assessments in daily life, the high reliability, and the within-person perspective, the electronic diary has great potential to clarify severe burnout.

Summary
Due to the fact that burnout research has been dominated by organizational psychologists, knowledge on severe burnout is limited and needs to be expanded. This is particularly of concern to individuals in countries where burnout is an accepted reason for sick leave and where treatment is sought and found, since clinical practice still lacks empirical underpinning. Consensus on diagnostic criteria for burnout is still lacking as well. Examination of burnout from a clinical and health psychological perspective faces several other challenges as well as a consequence of the healthy worker effect. First, researchers should be aware that they treat burnout as a dichotomous concept, while it was originally launched as a continuous concept. Second, the work-relatedness and three-dimensionality of burnout yield assessment difficulties in those individuals on long term sick leave. The current thesis will face these challenges and aims to clarify the actual occurrence of burnout symptoms and their associations when the individual is on extended sick leave at home. The electronic diary is a promising method to accomplish this aim by its accurate and detailed assessments in the natural context of the individual.

THE CURRENT THESIS

Purpose of the thesis

The primary aim of this thesis is to enlarge our understanding of severe or clinical burnout, through an extensive study on the actual functioning in daily life of individuals with *clinical* burnout. First, we will focus on the severity of exhaustion, the core symptom, and examine its diurnal course in comparison to healthy functioning as well as its resistance to change over 6-months. Second, we will examine the direct influence of poor sleep quality on the lack of recovery through sleep, as well as the long-term influence of poor recovery through sleep and sleep quality on burnout maintenance. In all of our analyses we will control for the possible influence of depressive symptomatology. The research issues will be examined by employing a reliable and detailed electronic diary. We will, therefore, also examine whether this new assessment method helps shed new light on the results provided thus far by psychophysiological research.

Design

This thesis comprises a longitudinal electronic diary study resulting in an extensive data set. Sixty clinically burned-out individuals on extended absence kept an electronic diary for 2 weeks. Every day they completed, 1 morning diary right after awakening (to assess sleep quality and exhaustion), 5 random alarm-controlled

diaries to assess exhaustion and depression and, 1 evening diary to assess exhaustion at the end of the day. Next to these symptom assessments, the diaries assessed several other parameters such as, situational contexts. We collected saliva cortisol samples on 3 consecutive workdays from most participants within this 2 week period. Forty healthy control participants followed the same procedure. After a follow-up period of 6 months measurements were repeated in the clinical burnout group. The electronic diary method is described in detail in Chapter 2. The endocrine measures are described in detail in Chapter 5.

Outline of the thesis

We start in Chapter 2 with the examination of the feasibility of an electronic diary study in clinically burned-out individuals. The electronic diary method requires high effort and continuous motivation from its participants. Since the electronic diary has been successfully employed in other clinical samples (Affleck et al., 1998; Peters et al., 2000; Wood, Magnello, & Sharpe, 1992), we expect to find the same results here, though this is, of course, not guaranteed. The method's feasibility is measured according to compliance to the protocol and participant acceptability. Also, repetitive measuring should not influence the assessments themselves, in other words, the method must not yield reactivity by means of habituation or sensitization.

In Chapter 3 we compare the diurnal course of fatigue and exhaustion in burned-out individuals with that of healthy individuals (Maslach et al., 2001). Since burnout is thought to be the result of a long process of energy depletion (Hobfoll, 2001; Shirom et al., 2005), we expect the end-stage, namely clinical burnout, to be characterized by a continuous state of exhaustion with little variability and flattened diurnal patterns.

In Chapter 4 we explore the unresponsiveness of fatigue to sleep in burnout. Noting that sleep problems are a common complaint amongst burned-out individuals (Melamed et al., 1999), we examine whether this relates to the poor nightly recovery from fatigue. In addition to looking at individual differences, we prospectively examine whether affected sleep is related to poor recovery from fatigue the following morning, within each individual. Finally, we test the hypothesis stating that poor recovery through sleep is truly a burnout symptom and not a marker for depression.

In Chapter 5 we examine whether symptom severity relates to stress hormonal assessments in clinically burned-out individuals. A leading thought in burnout research is that HPA-axis functioning is deregulated in burned-out individuals (Raison & Miller, 2003). The fact that previous studies have failed to observe any relations between symptom severity and the physiological measures cortisol and DHEAS (Galantino, Baime, Maguire, Szapary, & Farrar, 2005; Mommersteeg, Heijnen, Keijsers et al., 2006; Mommersteeg, Heijnen et al., 2006b)

might be the result of using retrospective questionnaires and a between-subject design (Bolger et al., 2003; Hruschka, Kohrt, & Worthman, 2005). To overcome these possible drawbacks we use the electronic diary method, which provides a more reliable estimation of symptom severity and provides the opportunity to distinguish between- and within-individual relationships. In this way we heighten the sensitivity with which possible relationships between symptom severity and endocrine values in clinical burnout are examined.

Chapter 6 describes the possibility for recovery from clinical burnout. We examine whether the symptom stability found in mild burnout holds for employees who call in sick and ask for professional help. In a 6-month follow-up study we examine symptom recovery and return to work, and whether both outcomes cohere. As in Chapter 4 we draw attention to poor restoration of energy through sleep and poor sleep quality in clinical burnout. Here, we study whether poor recuperation through sleep and problems in sleep hinder long-term recovery and work resumption in clinically burned-out individuals.

Chapter 7 constitutes a general discussion on the main findings of the current thesis. We address the implications for clinical practice and make recommendations for future research.

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Appendix I. ICD-10 categories proposed to assess clinical burnout

Burnout
ICD-10: Z73.0 (WHO, 1993)
Category: Problems related to life-management difficulty

a state of vital exhaustion

Work-related Neurasthenia
ICD-10: F48.0 (WHO, 1993)
Category: F48 other neurotic disorders

Considerable cultural variations occur in the presentation of this disorder, and two main types occur, with substantial overlap. In one type, the main feature is a complaint of increased fatigue after mental effort, often associated with some decrease in occupational performance or coping efficiency in daily tasks. The mental fatigability is typically described as an unpleasant intrusion of distracting associations or recollections, difficulty in concentrating, and generally inefficient thinking. In the other type, the emphasis is on feelings of bodily or physical weakness and exhaustion after only minimal effort, accompanied by a feeling of muscular aches and pains and inability to relax. In both types a variety of other unpleasant physical feelings is common, such as dizziness, tension headaches, and feelings of general instability. Worry about decreasing mental and bodily well-being, irritability, anhedonia, and varying minor degrees of both depression and anxiety are all common. Sleep is often disturbed in its initial and middle phases but hypersomnia may also be prominent.

Fatigue syndrome

Neurasthenia cannot occur in the presence of a generalized anxiety disorder.

Excludes : asthenia NOS (R53); burn-out (Z73.0); malaise and fatigue (R53); postviral fatigue syndrome (G93.3); psychasthenia (F48.8)

NB. The criterion ‘work-relatedness’ of the symptoms is added by researchers or clinicians when the diagnosis neurasthenia is applied to clinical burnout. This is *not* specified in the ICD-10 itself.

Appendix II. DSM-IV categories proposed to assess clinical burnout

Undifferentiated Somatoform disorder
DSM-IV: 300.81 (American Psychiatric Association, 1994)

A. One or more physical complaints (e.g., fatigue, loss of appetite, gastrointestinal or urinary complaints).
B. Either (1) or (2):
    1) after appropriate investigation, the symptoms cannot be fully explained by a known general medical condition or the direct effects of a substance (e.g., a drug of abuse, a medication)
    2) when there is a related general medical condition, the physical complaints or resulting social or occupational impairment is in excess of what would be expected from the history, physical examination, or laboratory findings
C. The symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.
D. The duration of the disturbance is at least 6 months.
E. The disturbance is not better accounted for by another mental disorder (e.g., another Somatoform Disorder, Sexual Dysfunction, Mood Disorder, Anxiety Disorder, Sleep Disorder, or Psychotic Disorder).
F. The symptom is not intentionally produced or feigned (as in Factitious Disorder or Malingering).

Adjustment disorder
DSM-IV: 309 (American Psychiatric Association, 1994)

A. The development of emotional or behavioral symptoms in response to an identifiable stressor(s) occurring within 3 months of the onset of the stressor(s).
B. These symptoms or behaviors are clinically significant as evidenced by either of the following:
    1) marked distress that is in excess of what would be expected from exposure to the stressor
    2) significant impairment in social or occupational (academic) functioning
C. The stress-related disturbance does not meet the criteria for another specific Axis I disorder and is not merely an exacerbation of a preexisting Axis I or Axis II disorder.
D. The symptoms do not represent Bereavement.

Once the stressor (or its consequences) has terminated, the symptoms do not persist for more than an additional 6 months. *Specify* if: Acute: if the disturbance lasts less than 6 months, or Chronic: if the disturbance lasts for 6 months or longer Adjustment Disorders are coded based on the subtype, which is selected according to the predominant symptoms.

Appendix III. National diagnostic solutions for clinical burnout

Exhaustion syndrome
Swedish addition to the ICD-10 2005: F43.8 (Socialstyrelsen, 2005)
Category: F43.8 Other reactions to severe stress

The criteria are: physiological or mental symptoms of exhaustion for at least two weeks, an essential lack of psychological energy, and symptoms as difficulties to concentrate, decreased ability to cope with stress, irritability or emotional lability, sleep disturbances and/or ache or pain, dizziness or palpitations having had to co occur every day during a two-week period. The symptoms must cause significant clinical suffering with impaired work capacity, and the symptoms must not be related to other psychiatric diagnosis, substance abuse, or medical diagnosis.

Work-related burnout/nervous breakdown
Dutch practice guidelines for occupational physicians based upon DSM-IV (J. J. L. Van der Klink, Blonk, Schene, & Van Dijk, 2003)

Clinical presentation
A combination of symptoms like fatigue, emotional exhaustion or instability, tension, sleep disturbances, feelings of insufficiency, listlessness, depressed mood. The combination of symptoms is due to work-related stressful circumstances. The symptoms often co-occur with a specific physical complaints.

Exposure
Exposure to (a combination of) problematic situations (stressors) at work that need to be resolved by the employee, while the employee feels he/she lacks the necessary competences.

Three types of stressors are discerned:
1. Work pressure: amount of work, time pressure, emotional work. Responsibility, lack of executive control.
2. Autonomy: autonomy, reorganization, etc.
3. Social support: conflict with colleagues, superiors or subordinates, annoyances, lack of support, appreciation or feedback. Difficult situations with pupils or patients etc.

Minimal exposure intensity: not quantifiable
Minimal exposure duration: not quantifiable

Minimal duration of work disability :
Less than 6 months → nervous breakdown or surmenage
More than 6 months → burnout

Chapter 2

Feasibility of an electronic diary in clinical burnout

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ABSTRACT

Electronic diaries overcome important drawbacks of retrospective reports and capture fluctuations of psychological states and behavior. The current study represents the first use of this method in clinically burned-out subjects and aims to establish its feasibility concerning participant acceptability, compliance and reactivity in this sample. Electronic diary measurement of burnout symptoms was performed five times a day for 2 weeks in 60 burned-out participants on sick leave and in 40 healthy controls. The method was well accepted, compliance was high (81 to 96%) and no reactivity effect was found on the recording of burnout symptoms. We conclude that the electronic diary employed is accurate, reliable and a promising tool in capturing key symptoms and their fluctuations in clinical burnout.

INTRODUCTION

Although questionnaires constitute the most common assessment instrument in psychology, electronic diary methods, like the Experience Sampling Method (ESM; Csikszentmihalyi & Larson, 1987) and Ecological Momentary Assessment (EMA; Stone & Shiffman, 1994), are gaining ground. One main advantage of a diary is that *retrospection bias,* by which questionnaires are hampered, is circumvented. The required cognitive processes in cross-sectional assessments, such as remembering and integrating past experiences, restrict its accuracy, in particular in rapidly fluctuating symptoms such as fatigue (Hufford, Shiffman, Paty, & Stone, 2001). A diary increases reliability of assessments through the immediate measurement of states and, in addition, can identify the fluctuations in mental or physical states, as well as determinants of these fluctuations (Bolger, Davis, & Rafaeli, 2003). Paper-and-pencil diaries are easy to employ, but electronic diaries, programmed into a pocket computer, are definitely preferable and should be employed if possible (Christensen, Feldman Barrett, Bliss-Moreau, Lebo, & Kashub, 2003).

Electronic diaries have been successfully used in many areas (Bolger et al., 2003), but the present study is the first to employ this method in *clinical burnout* patients. Clinically burned-out patients suffer from severe exhaustion and fatigue due to chronic work stress, which has resulted in extended absence (Schaufeli et al., 2001). In a related sample of chronic fatigue syndrome patients (CFS; Stone, Broderick, Porter, & Krupp, 1994) the diary was successfully employed, but specific characteristics of clinical burnout might reduce participant acceptability and threaten reliable recordings. One major difference is the rapid life change burnout participants experience when reaching the ‘dead end’ of sick leave, while the CFS patients were in a more stable situation, having the diagnosis for an average of 4.1 years. This ‘crisis situation’ leads to demoralization and despondence, which might decrease motivation as well as compliance. Moreover, clinical burnout is characterized by heightened annoyance (Schaufeli & Enzmann, 1998, p.25), which is less prominent in CFS (Fukuda et al., 1994) and thus may also hamper the acceptability of the method in the present sample. The explicit testing of the feasibility of an electronic diary in burnout is therefore preeminent: if established this might boost diary research in this prominent area in health psychology.

The successful application of an electronic diary requires (1) *participant acceptability,* i.e. convenience of the method beneficial to compliance (Hufford et al., 2001), (2) *compliance*, which is assured when entries are not systematically and substantially missing, and (3) absence of *reactivity,* i.e. the absence of changes in ratings of symptoms over time due to the method of diary keeping itself, which threaten the reliability and generalizability of the data such as increases due to

sensitization or decreases due to habituation in the ratings (Csikszentmihalyi & Larson, 1987). The aim of the present paper is to examine these three requirements for an electronic diary study in clinical burnout.

METHOD

Participants

The sample consisted of 60 clinically burned-out patients on sick leave (Age *M* = 42.9, 55% females, average sick leave: 4 months) and 40 healthy employees (Age *M* = 42.8, 65% females). The burned-out participants were recruited at Dutch centers of expertise in burnout treatment (42%) and the Internet. Internet recruitment was carried out by linking five national websites on burnout and stress to the research information on the University Intranet (www.fss.uu.nl/burnoutonderzoek). Healthy employees were recruited through newspaper advertisement and among acquaintances of burned-out participants and research assistants.

Burned-out subjects were included when they suffered from severe burnout complaints (Maslach Burnout Inventory-General Survey (MBI-GS): exhaustion ≥ 2.20, and either cynicism ≥ 2.00 or personal accomplishment ≤ 3.67; Schaufeli & Van Dierendonck, 2000; Checklist Individual Strength (CIS) ≥ 76; Bültmann et al., 2000). Healthy participants had of course to be free from burnout complaints (MBI-GS Exhaustion ≤ 2.20 and either Cynicism ≤ 2.00 or Personal Accomplishment ≥ 3.66; CIS < 76). Both patients and controls were excluded when (a) suffering from severe psychopathology as assessed with the Symptom Checklist-90-R (Arrindell & Ettema, 2002; burned-out participants ≤ 214 and healthy controls < 183) or indicated during a semi-structured clinical interview (Hoogduin, Knepper, & Csansky, 1999), (b) when using antidepressants or anxiolytics, or (c) if pregnant.

Not included in these 100 participants were 5 burned-out participants and 3 control participants who didn't finish the diary assessment. Three burned-out participants dropped out during the first week of assessment because of an underestimation of the required effort. Four participants (3 control subjects and 1 burned-out subject) produced unreliable data due to serious neglect of the instructions, for example breaking the PDA and the misuse of the morning and evening diaries despite thorough instructions. In one case the data were erased due to technical problems.

Measurement

Evaluation questionnaire

The evaluation questionnaire consisted of 10 items evaluating electronic diary features, technical features, willingness to participate again and self-assessed compliance. Items had to be rated on a 4-point scale (0 = *not at all* to 3 = *very much*). The questionnaire was partly adapted from an evaluative questionnaire employed by Stone et al. (2003).

Table 1. Electronic diary features

Features		***Description***
Data acquisition interface		
Hardware	Palm™	• Four similar types of Palm™ were used: the m125, m130, Zire and Zire31 • Soft touch screen with pen
Software	Diary timer (Ir. PhD. J.H. Houtveen, Utrecht University)	• Programming of alarms • Blocking of unused buttons
	Pendragon Forms 3.2 (Pendragon Software Corporation)	• Running of the diary, according to all necessary ESM/EMA requirements • One item per screen, forced answering and no leafing through present or previous diaries
Accessories	Leather case	Could be attached to the belt
	Memory card	Secure Digital [SD] card 16 MB
Convenience options		
Sampling Scheme	Adjustment to individual sleep-wake cycles	Automatic skipping of alarms between evening and morning diary
Alarm sound	Adjustable alarm sound	Low - Medium – High
	Repeating alarms	No response after 6 min induced a repetition of the signal, to be repeated two times.
	Time to respond	No response after 20 min induced the recording of a missed entry
	Silent alarm	• Visible signal instead of an audible beep • Extension of the possibility for diary recording to the complete interval between programmed alarms

Electronic diary (ED)

The diary employed in this study was programmed into a Personal Digital Assistant (PDA) pocket computer and conducted with time sampling according to ESM/EMA. The acquisition interface and convenience options are displayed in Table 1. Items were constructed according to ESM/EMA premises (Delespaul, 1995), and selected and adapted through expert meetings and pilot testing in 4 burned-out subjects. The alarm-controlled diary assessed burnout symptoms, cognitive and behavioral responses to fatigue and contextual factors. The morning diary assessed sleep quality during the night and exhaustion at waking up, while the evening diary assessed exhaustion at bedtime, and relevant aspects of the day, such as naps and work. Most items were answered on 7-point scales anchored 1 = *not at all* to 7 = *very much*, while other questions required answering by yes/no, time, and brief open responses to be typed on a small keyboard presented on the screen of the PDA. The number of items in the alarm-controlled diary ranged between 37 and 70, because the appearance of many items depended upon the reported presence of fatigue, on the context (work/home) or type of activity (trivial/important).

Procedure

New patients of three Dutch expert centers of burnout treatment and enrollments from the Internet received a brochure, a screening questionnaire and a permission to be approached form. Included participants received an informed-consent form and additional questionnaires. During a 1-hour instruction at home, the electronic diary was demonstrated and recording was started. For 2 weeks, participants were signalled randomly within 2½-hour time units to fill out the diary. Within 2 days participants were called to inquire about experiences and potential problems, and telephone support was available during the entire recording period. Afterwards, the PDA was collected and a debriefing interview was held, together with a semi-structured clinical interview. The local human research ethics committee approved of the study.

Statistical analysis

Since within-subject dependency in the diary data (records are nested within days, nested within persons) must be accounted for in the testing of reactivity, we employed multilevel regression modeling to test symptom changes over the 2-week recording period, conform the procedures advocated by Stone, et al. (2003) and using software MlwiN 1.0. First ‘time of the diary recording’ was entered into the equation to control or the impact of diurnal cycles. Then ‘day of measurement’ was entered to establish the extent to which day predicted changes over the 2 weeks in the diary scores on the burnout symptoms ‘fatigue’, ‘exhaustion’ and ‘energy’ and in

'depressed mood' as the most important accompanying symptom of burnout. While multilevel testing for reactivity utilized all records and days, Figure 1 was based on the 13 days with total coverage of measurement, leaving out the incomplete days of onset and conclusion of monitoring. Delayed records (>20 minutes) and records with an unacceptable completion time (>25 minutes) were a-priori excluded from the reactivity analysis according to the proposal of Csikszentmihalhyi & Larson (1987).

RESULTS

Participant acceptability

Clinically burned-out participants accepted the electronic diary method very well according to the outcomes of the evaluation questionnaire. Participants considered the palmtop as easy to use (means on different aspects ranging from 0.17 to 0.43) and were satisfied with the clarity of the PDA training (M = 2.88). Burden, annoyance and interference on account of the diary were low (means ranging from 0.98 to 1.18). Burned-out participants did not appreciate the electronic diary method any less than healthy controls. On the contrary, the readiness to participate again was significantly higher in burned-out patients (M = 2.28 and M = 1.72, respectively, t = -2.93, p < .01).

Compliance

Table 2 presents compliance and basic diary data. We established for each participant the percentage of completed diaries relative to the original schedule of potential response (compliance) excluding alarms missed due to technical problems. Overall values were calculated by computing the mean of the individual rates. The compliance rate was 81% for the alarm-controlled diary and 96% and 94% for the morning and evening diary respectively. There were no group differences in this regard between healthy controls and burned-out patients.

Table 2. Compliance and basic diary data

Diary type	***Variable***	***Burnout***	***Control***	***Total***
		N = 60	*N* = 40	*N* = 100
		M (range)	*M* (range)	*M* (range)
Alarm-controlled	Average no. of days in study[a]	14.1 (14-18)	14.0 (13-16)	14.1 (13-18)
	Average no. of alarms	69.59 (43-88)	72.05 (62-82)	70.57 (43-88)
	Average no. of alarms/day[b]	4.79 (3.1-6.3)	5.14 (4.4-5.9)	5.02 (3.1-6.3)
	Average no. of silent alarms	1.55 (0-12)	2.87 (0-12)	2.08 (0-12)
	Average no. of technical missings	2.47 (0-24)	1.65 (0-15)	2.14 (0-24)
	Average no. of completed prompts	55.22 (26-73)	56.10 (28-76)	55.56 (26-76)
	Compliance	83% (47-100)	80% (41-97)	81% (41-100)
Morning	Average no. of completed diaries	13.35 (0-16)[c]	13.55 (12-15)	13.43 (0-16)
	Compliance	95% (0-100)	98% (86-100)	96% (0-100)
Evening	Average no. of completed diaries	13.32 (0-15)[c]	13.00 (7-15)	13.19 (0-15)
	Compliance	94% (0-100)	93% (50-100)	94% (0-100)

Note. The alarm program was lost for 2 participants. Number of alarms and missings could not be calculated. Therefore, the sample sizes for alarm-controlled diary data consisted of 39 healthy control participants and 59 burnout participants.
[a] The PDA was carried for 14 periods of 24 hours: 13 full days and 2 half days, that is day of instruction and day of collection of the PDA. [b] Number of alarms differed between participants because of its dependency on individual sleep-wake cycles. [c] For unknown reasons 2 burnout subjects rendered little or no morning diaries, and 1 rendered no evening diaries.

Reactivity

Figure 1 plots the mean scores +/-1 standard error of the variables based on the aggregated scores per day per subject across the 2 weeks of diary monitoring. Except for depressed mood (β = -.01, p < .15), multilevel regression analysis detected minor linear effects: exhaustion (β = -.02, p < .001) and fatigue (β = -.02, p < .01) decreased, while energy (β = 0.11, p < .02) increased somewhat over the days of diary recording. The variance explained by days in these variables was extremely low (R^2 = 0.2% in both exhaustion and fatigue and 0.05% in energy), which underscores that the time effects are negligible. No interaction effect of group and measurement day was detected.

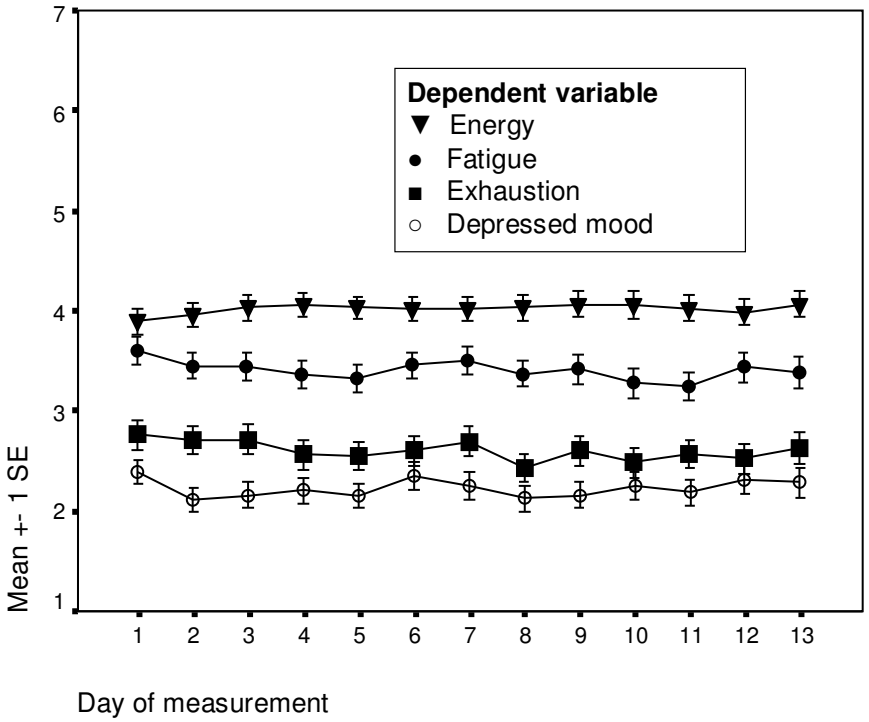

Figure 1. Means and SEs of dependent variables across days (Reactivity)

DISCUSSION

Aim of the present paper was to establish prerequisites for an electronic diary study in clinically burned-out patients. According to the results the electronic diary method was highly acceptable, and compliance indicated by sufficient response rates was good. The small significant trends in energy levels in the two weeks of diary recording explained almost none of the variance, indicating that no clinically relevant reactivity to the method occurred.

It is well established in various samples that participant acceptability is generally not a problem (Bolger, et al., 2003). The same can be said for the present burnout sample. Remarkably, there were no differences in acceptability of the diary and PDA between extremely fatigued and healthy persons. Burned-out participants were even more willing to participate in a similar study again. Yet, 3 burned-out participants, and none of the control participants, dropped out due to unexpected burden of the electronic diary. In addition, a minority of participants had serious

problems in handling the diary and/or PDA, but this applied to burned-out (*n* = 1, 1.5%) and to healthy subjects (*n* = 3, 6.9%).

In EMA a maximum of 20% missed signals is considered satisfactory (Stone & Shiffman, 2002), though the authors acknowledge that this criterion level of response is arbitrary. The leading thought in this matter is that a higher proportion of non-compliance increases the chance of systematic bias in the data. The average response rate of the alarm-controlled diary in the present study (81%) was thus considered acceptable, and comparable to previously observed response rates (ranging from 76 to 94%; Litcher-Kelly, Stone, Broderick, & Schwartz, 2004; Roelofs et al., 2004; Stone et al., 2003). Though sufficient, compliance in this study was considerably lower than the excellent 94% in the studies of Litcher-Kelly et al. (2004) and Stone et al. (2003). We suggest two methodological explanations for the discrepancy between 94 and 81%. First of all, the number of items in this study was considerably higher (37 to 70 items) compared to the other studies (19 items). More important, in the aforementioned studies and not in the present study, individual feedback on compliance was given halfway through the measurement period, which is known to increase compliance dramatically (Christensen et al., 2003). Yet, compliance rates of the morning and evening diary were high (94% and 96% respectively) and the debriefing interview and notes in the diaries revealed that missed alarms were mainly due to engagement in activities that could not be interrupted. Because of these considerations we have confidence in the reliability of the data.

Reactivity effects of momentary assessment, mostly studied in chronic pain and tested regarding changes in pain intensity over time, were absent in prior studies (Cruise, Broderick, Porter, Kaell, & Stone, 1996; Stone et al., 2003). The present data did show statistical significant effects of time regarding fatigue, exhaustion and energy, but the effects were negligible, explaining almost none of the variance.

A limitation of the present study is the lack of information about volunteer rates or non-responders. According to the inclusion criteria the present study was executed in subjects with severe job-related burnout being on full or partial sick leave. It is not as yet assured, however, whether even more severe cases would be willing to participate. Therefore, the current findings might not be generalizable to those cases.

We conclude nevertheless that the present findings help to pave the way for electronic diary studies in burnout patients. The method is likely to permit reliable, detailed and in-depth investigations of burnout symptoms in the context of actual daily life. We expect that this will contribute to a deepened understanding of the burnout syndrome and will permit to identify the dynamic characteristics of the key symptoms.

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Chapter 3

Electronic diary evidence on energy erosion in clinical burnout

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ABSTRACT

Burnout is generally defined as a state of severe exhaustion. So far, research has predominantly focused on relatively mild burnout in employees able to work despite their complaints. This study examines energy depletion in clinical burnout, (e.g. the severest cases on extended sick leave) by comparing the diurnal patterns of fatigue and exhaustion with those of healthy individuals. Sixty clinically burned-out and 40 healthy participants kept an electronic diary for 14 days, seven times a day, yielding a total of 8,116 diary entries. This study shows that burned-out individuals typically suffer continuously from a severe fatigue throughout the day. The resulting flattened diurnal cycles mark a stable exhaustion that is uncommon in healthy persons. The current results provide novel support for the existence of severe energy erosion in clinical burnout.

INTRODUCTION

Burnout is a serious health risk for employees who experience chronic stress at work (Maslach, Schaufeli, & Leiter, 2001). Burnout syndrome is characterized by exhaustion, cynicism towards work and reduced personal accomplishment at work. Burnout increases the risk of sick leave (Bekker, Croon, & Bressers, 2005; Borritz, Rugulies, Christensen, Villadsen, & Kristensen, 2006; Janssen, Kant, Swaen, Janssen, & Schroer, 2003), and burned-out employees on extended sick leave have become a significant problem in Western countries such as the Netherlands.

The present study focuses on *clinical burnout*, which refers to individuals with severe burnout complaints, resulting in sick leave and/or a call for professional help (De Vente, Olff, Van Amsterdam, Kamphuis, & Emmelkamp, 2003; Roelofs, Verbraak, Keijsers, Bruin & Schmidt, 2005; Schaufeli, Bakker, Hoogduin, Schaap, & Kladler, 2001). This focus is important for two reasons. First, although severe burnout has been explicitly distinguished ('burnout mental disability'; Paine, 1982), research on clinical burnout is scarce (Kant, Jansen, Amelsvoort, Mohren, & Swaen, 2004; Schaufeli, Bakker, Hoogduin, Schaap, & Kladler, 2001). Current knowledge of burnout is therefore prone to a 'healthy worker effect' (Karasek & Theorell, 1990), e.g. the systematic overrepresentation of employees still at work suffering from relatively mild burnout or the 'burnout stress syndrome' (Paine, 1982). Second, clinical burnout, particularly the chronic exhaustion that constitutes its core symptom, seems resistant to change and difficult to reverse (Shirom, Melamed, Toker, Berliner, & Shapira, 2005). One factor involved is that enduring stress may have induced physiological changes that reinforce the state of burnout. Melamed and colleagues propose pathways by which burnout may endure, such as sleep problems, deregulations of the metabolic system, and deregulations of the immune system (Melamed, Shirom, Toker, Berliner, & Shapira, 2006). What is lacking thus far is a window on the state of exhaustion in clinical burnout, when the individual is in fact no longer prone to the stress-inducing conditions of the work environment. Sound insight as to the course and peculiarities of exhaustion under conditions of sick leave is necessary to an understanding of the disability in clinical burnout and to the advancement of treatments for its reversal. This study closely examines exhaustion, the core symptom of clinical burnout (Maslach, Schaufeli, & Leiter, 2001; Schaufeli & Enzmann, 1998; Shirom, 2003). We particularly aim to examine deregulations in the variability and diurnal patterns of exhaustion and fatigue relative to the functioning in healthy individuals.

Energy levels of healthy individuals fluctuate throughout the day, and fatigue follows a U-shaped pattern that peaks in the evening (Stone, Smyth, Pickering, & Schwartz, 1996). According to burnout theory exhaustion is a fatigue symptom

(Maslach & Schaufeli, 1993) that is conceived as a chronic form of acute fatigue in healthy individuals, and is no longer responsive to normal periods of rest (Meijman & Schaufeli, 1996; Winwood, Winefield, Dawson, & Lushington, 2005). The question now is how healthy fatigue can develop into a state of chronic exhaustion, which is characteristic of severe or clinical burnout. The marker of burnout syndrome is a 'progressive loss of energy' (Edelwich & Brodsky, 1980) or 'psychological erosion' (Etzion, 1987), from which it is hard to recover without 'outside help or environmental rearrangement' (Brill, 1984). According to the conservation of resources (COR) theory, burnout occurs when resources (time, energy) are invested into work while no resources are gained, resulting for instance in missed opportunities and borrowing from family time and/or intimacy (Hobfoll, 2001). COR theory holds that the initial loss of resources brings forth further losses, thus setting off a spiral of losses. Therefore, the continuous state of exhaustion that is observed in severe burnout appears as the end of enduring loss of energy (Hobfoll, 2001; Shirom et al., 2005) and hence as a state of severe energy erosion. This energy erosion, which springs from a spiral of losses and is thought to be accompanied by physiological deregulations, explains why exhaustion is difficult to reverse even under the condition of sick leave (e.g. in the absence of the original work stressor): the individual lost the resilience intrinsic to normal or acute fatigue that characterizes healthy functioning.

The current study intends to depict energy states in clinical burnout and healthy individuals within the context of daily life. For this purpose high-density electronic diary recording is employed, coined as Ecological Momentary Assessment (EMA; Stone & Shiffman, 1994) or the Experience Sampling Method (ESM; Csikszentmihalyi & Larson, 1987). This method captures the actual state of an individual at a particular moment. In the present study both the measures of fatigue and of exhaustion are important to assess the state of disability in clinical burnout. According to questionnaire assessments of working employees with mild burnout the experiences of fatigue and exhaustion are strongly related (r = .78; Michielsen, Willemsen, Croon, Van Heck, & De Vries, 2004). This may, however, not be the case in healthy individuals, simply because healthy individuals might not experience exhaustion to a substantial extent, although it has been suggested that fatigue and exhaustion are indistinguishable in subjective experience in the general population (Houtman, Schaufeli, & Taris, 2000). It may, on the other hand, also not hold for individuals with clinical burnout, because the distinction might be obscured by the energy erosion in this condition. These suppositions underscore the necessity to separately assess fatigue and exhaustion in both groups in the present study, to compare the state of clinical burnout with that in healthy individuals. This is of interest also, because the interrelation of momentary exhaustion and fatigue has not

as yet been established in clinical burnout. Regarding the state of *exhaustion* we expect that clinical burnout is marked by a daily experience of continuous exhaustion that occurs with little variability during the course of the day. This means that the diurnal pattern of exhaustion is expected to be flattened in clinical burnout as opposed to the normal fluctuations observed in healthy individuals. Regarding the state of *fatigue* we expect the same results concerning group differences in variability and diurnal patterns.

In short, the hypotheses tested in this study are that individuals with clinical burnout exhibit substantially lower within-person variability of exhaustion (*Hypothesis 1a*) and fatigue (*Hypothesis 1b)*, and flattened or lost diurnal patterns of exhaustion (*Hypothesis 2a)* and fatigue (*Hypothesis 2b)* as compared to healthy individuals. If confirmed, the findings reflect that clinical burnout is characterized by severe energy erosion, which adds to our understanding of the suffering in clinical burnout and the societal problem it inflicts.

METHOD

Participants and procedure

Clinically burned-out participants were recruited from new enrollments in Dutch centers of expertise in treatment of work-related problems, as well as through the Internet. Potential participants received a brochure and a screening questionnaire consisting of the Maslach Burnout Inventory General Survey (MBI-GS or in Dutch UBOS; Schaufeli & Van Dierendonck, 2000), the Checklist Individual Strength (CIS; Bültmann et al., 2000) and the Symptom Checklist-90-R (SCL-90-R; Arrindell & Ettema, 2002). Participants were classified as clinically burned-out when they suffered from severe burnout complaints according to validated cut-off points of the MBI-GS: that is, a high level of exhaustion (≥ 2.20), and either a high level of cynicism (≥ 2.00) or a low level of personal accomplishment (≤ 3.67). In addition, a high level of fatigue as measured with the CIS was required (≥ 76). The complaints had to be reason for sick leave and/or for treatment. When participants met the questionnaire criteria, a psychologist conducted a semi-structured clinical interview (Hoogduin, Knepper, & Csansky, 1999). This interview consisted of a general anamnesis and the systematic assessment of DSM-IV axis-I disorders and work-related neurasthenia. Participants had to meet the criteria for work-related neurasthenia according to the ICD-10, (Schaufeli et al., 2001; WHO, 1993). We excluded participants with primary psychiatric disorders other than work-related neurasthenia, but included participants with secondary co-morbidity (SCL-90-R general severity index had to be < 214 -i.e. top of the psychiatric outpatients norm

Table 1. Participant characteristics

	Group	***Healthy***	***Clinical burnout***	***p-value***
		n = 40	*n = 60*	
Variable		*M*(*SD*) or *n* (%)	*M*(*SD*) or *n* (%)	
Demographic variables				
Age (years)		41.8 (9.98)	42.9 (8.75)	*ns*
Gender ratio (% male)		14 (35.0%)	27 (45.0%)	*ns*
Married/cohabiting		33 (82.9%)	46 (76.7%)	*ns*
Home-living children		21 (52.5%)	33 (55.0%)	*ns*
Education	*College/university*	26 (65.0%)	35 (58.3%)	*ns*
	High school	10 (25.0%)	12 (20.0%)	
	Vocational education	4 (10.0%)	13 (21.7%)	
Hours according to contract	*33 – 40*	18 (45.0%)	33 (55.0%)	*ns*
	25 – 32	14 (35.0%)	18 (30.0%)	
	17 – 24	8 (20.0%)	6 (10.0%)	
	< 16	0 (0.0%)	2 (3.3%)	
	Not employed	0 (0.0%)	1 (1.7%)	
Complaints and sick leave				
Sickness leave	*Full*		32 (53.3%)	-
	Partial (rehabilitating)		28 (46.7%)	
Sickness leave (weeks)		-	15.8 (14.3)	-
Complaints duration (months)	*3 – 6*	-	9 (15.0%)	-
	6 –12		18 (30.0%)	
	> 12		33 (55.0%)	
Burnout characteristics				
Exhaustion (MBI-GS)		1.19 (0.54)	4.75 (0.99)	<.001
Cynicism (MBI-GS)		1.15 (0.78)	3.53 (1.34)	<.001
Personal accomplishment (MBI-GS)		4.77 (0.71)	3.56 (1.31)	<.001
General fatigue (CIS)		41.0 (12.9)	106.4 (14.9)	<.001
Severity of psychopathology				
Psychopathology (SCL-90-R)		104.1 (11.0)	181.4 (30.5)	<.001
Co-morbidity	*None*	-	39 (65.0%)	-
	Mood disorder		8 (13.3%)	
	Anxiety disorder		6 (10.0%)	
	Mood and anxiety disorder		3 (5.0%)	
	Mood and somatisation disorder		1 (1.7%)	
	Chronic pain disorder		1 (1.7%)	
	Somatisation disorder		1 (1.7%)	
	Adjustment disorder		1 (1.7%)	

Note. The scale range of the MBI-GS subscales was (0-6), of the CIS (20-140) and of the SCL-90-R (90-450).

scores- and according to the clinical interview). The healthy group was recruited through newspaper advertisements and through personal contacts. Healthy participants had to be free from burnout complaints (MBI-GS exhaustion ≤ 2.20 and either cynicism ≤ 2.00 or personal accomplishment ≥ 3.66; CIS < 76; SCL-90-R, < 183). Individuals using antidepressants or anxiolytics, and those that were pregnant were excluded from the study for both conditions.

Burnout recruitment rendered 409 responses, of whom 289 (71%) actually returned the screening questionnaire, and 65 respondents (22%) met the inclusion criteria. The small number of included participants was mainly due to a different psychological diagnosis, extremely high psychopathology (SCL-90-R), and the use of antidepressants. Sixty healthy participants responded to the call, and 50 healthy participants (83%) returned the screening questionnaire. Seven participants were excluded due to high burnout scores (MBI-GS; $n = 5$) and being too old concerning the matching criteria ($n = 2$). Of the 108 participants included, 3 clinically burned-out participants (4.8%) retreated from the project during the first week of assessment because they considered the required effort as being too high, 1 burned-out participant and 3 healthy control participants produced unreliable data due to serious neglect of the instructions, and in one burnout case the data were erased due to technical problems.

The final sample consisted of 60 clinical burnout participants, 42% from treatment centers and 58% from the Internet. A multivariate test rendered no significant group differences between both ways of recruitment on demographic variables, burnout characteristics, and diary variables ($F_{7,43} = 1.52$, $p = .19$). Participant characteristics of the final sample are shown in Table 1. All burned-out participants were on paid sick leave for 4 months on average ($SD = 3.60$), 53% on full sick leave and 47% on partial sick leave. Partial sick leave in the Netherlands occurs within the framework of rehabilitation, that is, when an employee is considered fit to work for only a part of the contractual working hours. The employee is on sick leave for the remaining (ill) hours of the contract. The healthy sample consisted of 40 participants recruited through newspaper advertisements (25%) and through personal contacts (75%). The burnout and control group were matched on gender, age and educational level in order to prevent that differences between groups may be attributed to these variables. Compared to the healthy controls, burnout complaints in the burnout group were significantly higher and at a clinical level. Healthy and burnout participants differed solely on inclusion criteria, indicating that both groups were successfully selected and matched.

Included participants received an informed-consent form, and a 1-hour instruction at home for using the electronic diary. They were actively approached by phone 2 days later to assess first experiences and potential problems. Telephone

support was also available during the recording period, which was concluded with a debriefing interview and collection of the PDA, and offering a remuneration of € 25 (roughly 25 US$). The study was approved by the local human research ethics committee.

Measurements

Electronic diary

We employed high-density electronic diary recording according to EMA/ESM. The accuracy of this method is superior to common retrospective questionnaires, which produce retrospection bias because these require the act of remembering and cognitive integration of past experiences (Peters et al., 2000; Stone, Broderick, Shiffman, & Schwartz, 2004). Moreover, an electronic diary allows for assessment of within-person fluctuations of symptoms (Bolger, Davis, & Rafaeli, 2003).

An electronic diary was programmed into a PalmOne^{TM} personal digital assistant (PDA) or handheld computer with an integrated alarm and soft-touch screen, allowing for simultaneous presentation and answering of items. Each day, for 2 consecutive weeks participants filled in a morning diary within 30 minutes after waking up, an evening diary before going to bed, and an average of five alarm-controlled diaries. A beeping signal occurred randomly within 2½ hour time units and prompted participants to fill in the alarm-controlled diary. All diary entries were automatically time-stamped. The items are designed to assess exhaustion and fatigue with single questions according to ESM premises, and to measure states instead of constructs and mimic an internal dialogue and thus to be short and formulated in common language (Delespaul, 1995). According to these premises, we formulated the items 'Right now I feel exhausted' and 'Right now I am tired', based on high loading items of the Dutch MBI-GS exhaustion scale ('I feel mentally exhausted from my work', Schaufeli & Van Dierendonck, 2000) and the CIS ('I feel fatigued', Vercoulen & Bleijenberg, 1999). In daily experience the dimensions of physical, mental or emotional fatigue are hard to differentiate. Consistent with the recommendation of Shen et al. (2006) we used the phrase 'I am tired' to represent fatigue in the electronic diary, because in spoken language this represents the common expression of fatigue of any kind (Shen, Barbera, & Shapiro, 2006). Answers were given on a 7-point scale anchored 1 = *not at all* to 7 = *very much*. The study yielded a total of 8,116 diary entries (1,344 morning diaries, 5,455 alarm-controlled diaries and 1,317 evening diaries). On average, a participant produced 71 alarm-controlled diaries, 13 morning and 13 evening diaries, which equals a response of 96%, 81% and 94% respectively, indicating that compliance was high in

both groups. No influence of the method itself on the measurements (reactivity) was detected (Sonnenschein, Sorbi, Van Doornen, & Maas, 2006).

Burnout questionnaire

Burnout was measured using the Dutch version of the Maslach Burnout Inventory General Survey (MBI-GS or in Dutch UBOS; Schaufeli & Van Dierendonck, 2000). High scores on the subscales exhaustion and cynicism and lower scores on personal accomplishment are indicative for burnout (for cut-off criteria see participants section above). The scoring ranged from 0 = *never* to 6 = *every day*. The internal consistencies for the subscales exhaustion, cynicism, and personal accomplishment were high (Cronbach's α = .95; α = .85; α = .89, respectively).

RESULTS

Correlations between questionnaire and diary assessment of exhaustion

To first explore the tenability of our assumption that the diary method indeed delivers another type of information as the MBI-GS questionnaire, we first present the Pearson PM correlations between the MBI-GS exhaustion score and both of the diary variables aggregated per individual (Table 2).

Table 2. Correlations between questionnaire (MBI-GS) and electronic diary measurement of exhaustion

	Clinical burnout			***Healthy***
Variable	***Total***	***Full sick leave***	***Partial sick leave***[1]	
	N = 60	*N* = 32	*N* = 28	*N* = 40
Exhaustion	.18	-.05	.47*	.55**
Fatigue	.35**	.21	.52**	.32*

Note. * $p < 0.05$ (2-tailed); ** $p < 0.01$ level (2-tailed); Partial correlations were computed, correcting for the time lag between questionnaire measurement and diary measurement. On average the MBI-GS was completed 1.4 days before the start of the diary recording; 95% confidence interval: - 4.5 to 1.7. [1] Partial sick leave in the Netherlands indicates that an employee is considered able to work for only a part of his/her official hours of employment. The remaining (ill) hours of his/her contract constitute paid sick leave.

A moderate relationship between diary measurement of fatigue and the MBI-GS exhaustion scale was found in both groups. No significant relation was found between diary measurement of exhaustion and the MBI-GS exhaustion scale in burned-out participants, while a moderate relation was found in the healthy control

group. Additional analysis revealed that clinically burned-out participants on full sick leave exhibited no significant correlations, while the correlations in clinically burned-out participants on partial sick leave were moderate and equal to healthy controls (Z = -.42, *ns*).

Descriptives and correlations

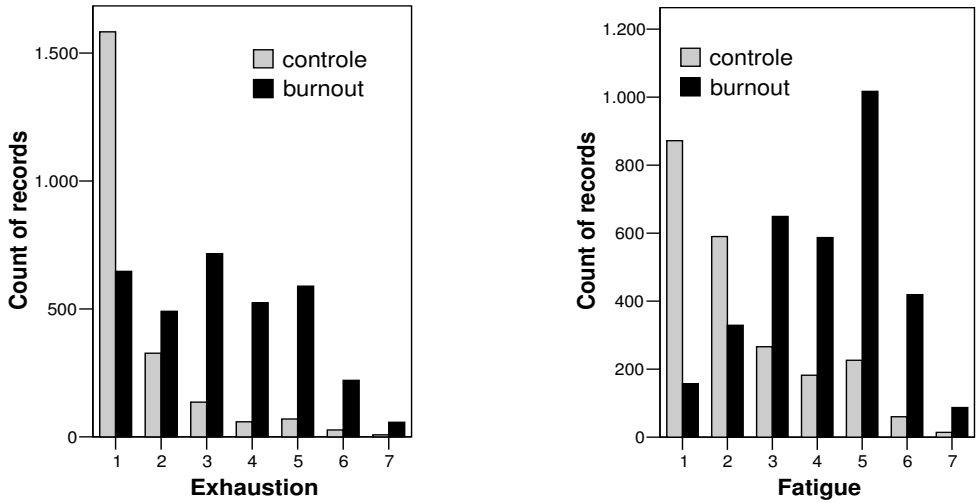
Table 3 shows the averaged intensity of exhaustion and fatigue in clinical burnout and healthy controls. Burned-out participants felt significantly more exhausted and more fatigued compared to healthy controls in all diaries (morning, alarm-controlled, and evening)[1]. Healthy participants experienced no exhaustion in most of their records (Table 3 and Figure 1a; skewness = 2.40, SE = 0.05; kurtosis = 5.57, SE = 0.10). Group differences were smallest in the evening.

Table 3. Descriptive statistics and within-person variability of exhaustion and fatigue

Variable	***Type of diary***	***Healthy*** (N = 40)	***Clinical burnout*** (N = 60)	***Mean difference***	***Effect size***
Intensity (M per individual)		*M (SD)*	*M (SD)*		
Exhaustion	Morning	1.63 (.71)	3.24 (1.08)	1.61***	1.70
	Alarm-controlled	1.60 (.61)	3.25 (.98)	1.65***	1.94
	Evening	2.36 (1.20)	3.87 (1.07)	1.51***	1.34
	All diaries	1.74 (.67)	3.35 (.94)	1.62***	1.92
Fatigue	Morning	2.35 (1.04)	4.01 (.96)	1.66***	2.23
	Alarm-controlled	2.37 (.68)	4.11 (.68)	1.73***	2.54
	Evening	4.54 (1.10)	5.37 (.62)	0.83***	0.98
	All diaries	2.71 (.69)	4.30 (.60)	1.59***	2.49
Within-person variability (SD per individual)					
Exhaustion	All diaries	.96 (.52)	1.29 (.38)	0.33***	.74
Fatigue	All diaries	1.56 (.34)	1.33 (.38)	-0.23**	-.63

Note. Scales range from 1 = *not at all* to 7 = *very*; ** p < .01 level. *** p <.001 level. Multivariate testing revealed a significant overall difference $F_{10,88}$ = 17.57. Presented are p-values for post-hoc univariate testing; None of the values differed for the burnout groups on partial sick leave or full sick leave.

[1] Multilevel regression modeling on disaggregated data showed large differences in exhaustion and fatigue intensity between both groups.



Figures 1a and 1b. Histogram of exhaustion and fatigue in all records for the healthy control and clinical burnout group. Scales range from 1 = *not at all* to 7 = *very*.

Table 4. Correlations of variables for clinical burnout (below diagonal) and healthy controls (above diagonal)

		Intensity		***Within-person variability***	
Level of analysis	***Variable***	Exhaustion	Fatigue	Exhaustion	Fatigue
General intensity	Exhaustion	-	.74**	.80**	.18
(aggregated *M*)	Fatigue	.71**	-	.60**	.42**
Within-person variability	Exhaustion	-.08	-.09	-	.46**
(aggregated *SD*)	Fatigue	-.47**	-.44**	.74**	-
Same-moment intensity	Exhaustion	-	.49**	-	-
(disaggregated)	Fatigue	.63**	-	-	-

Note. ** $p < .01$

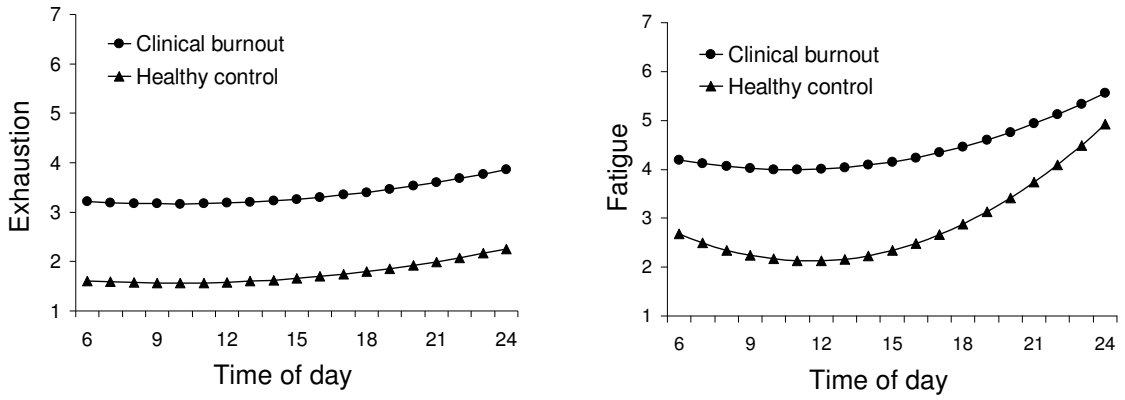
Table 4 shows the correlations between the intensity and within-person variability of exhaustion and fatigue, as well as the same-moment associations of exhaustion and fatigue. The same-moment associations of exhaustion and fatigue were tested with multilevel regression analysis to account for within-subject dependencies in the data. The individual mean intensities of exhaustion and fatigue were strongly related in both groups. Exhaustion was moderately related to fatigue assessed at the same moment. The same-moment, synchronous, correlation was significantly stronger in the clinical burnout group than in healthy controls ($Z = 9.59$, $p < .01$).

Within-person variability of exhaustion and fatigue (Hypotheses 1a and 1b)

The within-person variability of exhaustion was significantly higher in the burnout group than in the healthy control group. As mentioned above, healthy participants experienced almost no exhaustion and therefore this result might be due to a floor effect for exhaustion in healthy individuals (Figure 1a). However, as expected, the within-person variability of fatigue was less prominent in clinical burnout participants than in healthy controls (Table 3). Fatigue was approximately normally distributed in both groups (skewness and kurtosis < 1). Therefore, the findings cannot be attributed to a ceiling effect of fatigue in burnout (Figure 1b).

Diurnal cycles of exhaustion and fatigue (Hypotheses 2a and 2b)

In order to test the Hypotheses 2a and 2b multilevel regression modeling (Hox, 2002) was employed to detect differences in diurnal cycles. The variance in momentary exhaustion and fatigue was mainly due to differences between individuals (45.6% and 34.2%, respectively) and differences in time of day within individuals (42.2% and 57%). This indicates that differences between days - for example with respect to week and weekend days - were of minor importance: momentary exhaustion and fatigue varied mainly within days (diurnal course) and between individuals (burnout vs. healthy controls).



Figures 2a and 2b. Diurnal cycles of exhaustion and fatigue for the healthy control and clinical burnout group.

We tested our Hypotheses 2a and 2b by modeling the cross-level interactions of the linear and quadratic time trends (slope) and group membership in a random model[2] (Model 2, see Table 5). Separate analyses were conducted for exhaustion and

[2] In the random model the effect of the linear and quadratic slope on exhaustion/fatigue was 'allowed' to vary between individuals. The random models significantly fitted the data better than the fixed models (χ^2= 1150.47, p < .001 for exhaustion and χ^2 = 1492.03, p < .001 for fatigue).

fatigue. No significant interaction effect was found when we tested for group differences in diurnal course of exhaustion. In fatigue, however, the model with the cross-level interaction terms fitted the data significantly better than without the interactions. Figures 2a and 2b show the diurnal course of exhaustion and fatigue respectively as predicted by the multilevel equations. The diurnal pattern of fatigue showed a flattened U-shaped trend for burned-out individuals compared to healthy controls.

Table 5. Group differences in diurnal patterns of exhaustion and fatigue

Dependent variable	***Exhaustion***		***Fatigue***	
Independent variable				
(*n* = 8,116)	Model 1	Model 2	Model 1	Model 2
Fixed effects	*Estimate (SE)*	*Estimate (SE)*	*Estimate (SE)*	*Estimate (SE)*
Intercept	2.12 (.23)*	2.24 (.32)*	3.84 (.27)*	4.52 (.40)*
Group main effect	1.68 (.16)*	1.47 (.41)*	1.66 (.13)*	0.52 (.51)*
Time, linear slope	-0.11 (.02)*	-0.12 (.04)*	-0.28 (.03)*	-0.42 (.05)*
Time, quadratic slope	0.01 (.01)*	0.01 (.01)*	0.01 (.01)*	0.02 (.01)*
Group x linear slope interaction effect		0.03 (.05)		0.22 (.06)*
Group x quadratic slope interaction effect		-0.01 (.01)		-0.01 (.01)*
Random effects	*Variance*	*Variance (Expl R^2)* [2]	*Variance*	*Variance (Expl R^2)* [2]
Subject level	3.09	3.08	5.31	5.01
Random variance linear slope	0.04	0.04 (0.9%)	0.07	0.06 (16.0%)
Random variance Quadratic slope	0.01	0.01 (0.3%)	0.01	0.01 (30.6%)[3]
Day level	0.36	0.36	0.27	0.27
Beep level	1.05	1.05	1.36	1.32
Model fit[2]	25558.21	25556.55 (*ns*)[1]	26993.39	26954.02 (p<.01)[1]

* $p < .001$. [1.] Significance of the superiority of the model in fitting the data with respect to the previous model. [2.] The difference in explained variance as compared to the previous model is calculated as proportion of the random variance of linear slope and quadratic slope. [3.] Due to the small numbers the figures were rounded off to 2 decimals places, but explained variances was calculated on the real figures.

Confounders

Additionally, we tested for the influence of demographic (gender; age; education level), situational (being at work or elsewhere), and complaint characteristics (co-morbid psychopathology; complaint duration; duration of sick leave; partial or full sick leave) on the individual differences in intensity and diurnal course in exhaustion and fatigue in both groups, but found no additional explanations.

DISCUSSION

The aim of this study was to examine the daily experiences of severe depletion of energy in clinical burnout, and in particular the fluctuations in the state of exhaustion. Healthy controls hardly experienced any exhaustion in daily life. Due to this strong floor effect we were not able to use this variable to study the erosion of energy conform our original hypotheses. Our second variable, fatigue, did adequately capture lack of energy in healthy participants as well as in burned-out participants. As expected, clinically burned-out individuals showed substantially lower within-person variability and flattened diurnal patterns of fatigue in comparison with healthy individuals. The normal U-shaped pattern of fatigue produced by the healthy participants in the present study proved to be highly comparable to the healthy diurnal fatigue course identified in EMA studies (Stone, Broderick, Porter, & Krupp, 1994; Stone et al., 1996). Therefore, the affected variability and diurnal pattern of fatigue confirm our hypotheses and provides evidence for the idea that clinical burnout is characterized by severe erosion of energy, in line with COR theory (Hobfoll, 2001; Shirom et al., 2005).

Following the hypothesis of energy erosion, one might expect burnout participants with longer complaint duration to be more severely eroded than those with shorter complaint duration. This was shown not to be the case. Because burnout develops gradually, symptoms may remain unnoticed for a long time by the individual involved (Ekstedt & Fagerberg, 2005; Schaufeli & Enzmann, 1998, p.36). Coupled with the strong retrospective nature of asking for the onset of symptoms, it is unlikely that we have adequately captured the onset of the erosion process. Additionally, duration of sick leave did not influence symptom intensity or variability, and we did not find a difference between burned-out participants on full sick leave and on partial sick leave with regards to our hypotheses. Although calling in sick may be an indication of the severity of energy erosion, sickness absence can also be seen as a decision process and may not solely be determined by symptom intensity.

The daily variability and the diurnal course of fatigue and exhaustion have not yet been investigated in burnout. However, diary studies of the diurnal course of

fatigue have been conducted in other relevant domains, such as the chronic fatigue syndrome (CFS; Stone et al., 1994) and breast cancer survivors (Curran, Beacham, & Andrykowski, 2004). These studies yielded patterns resembling those of healthy individuals. The latter group also showed no differences in the initial fatigue levels in the morning, which was thought to be indicative of higher fatigability in breast cancer survivors (Curran et al., 2004). Although definite conclusions must await comparative studies in CFS and breast cancer survivors, the flattening of diurnal fatigue in clinical burnout observed in the present study might emerge as a typical characteristic of this syndrome. In addition, the present study showed that differences in fatigue levels between clinically burned-out and healthy individuals were smallest in the evening. This finding raises the challenging issue whether inability to recover through sleep, known from clinical evidence in burnout, and/or impaired sleep quality through the night may also be characteristic of severe burnout or even reinforce the state of burnout as proposed by Melamed and colleagues (2006).

As noted before, healthy participants reported no exhaustion at all in the majority of their records, but exhaustion was a daily experience in clinical burnout. Exhaustion and fatigue assessed at the same moment were moderately related in clinical burnout, but both states were clearly distinguishable, despite our presumption and that of others (Houtman et al., 2000). Exhaustion was rated as being less intense than fatigue, and thus a more severe form of fatigue. Moreover, within the burned-out group individuals diverged more on average exhaustion level than on average fatigue level. We conclude that the state of exhaustion is a more severe form of fatigue that evidently emerges only when fatigue becomes chronic. Therefore, we believe that our non-findings for exhaustion paradoxically do support the hypothesis that clinical burnout is characterized by severe erosion of energy.

Correlations between questionnaire and diary assessment of exhaustion

Since the current study is the first to employ electronic diary assessment of exhaustion in clinical burnout, we established the association between questionnaire assessment (MBI-GS) and electronic diary assessment of exhaustion. We wanted to explore the tenability of our assumption that the diary method indeed delivers another type of information as the MBI-GS questionnaire. The moderate associations we found between cross-sectional and momentary assessments of healthy participants and partially working burned-out participants are in line with the moderate relationships found in studies on pain and fatigue (Banthia et al., 2006; Peters et al., 2000). The cause of less than perfect correlations can be attributed to cognitive processes such as the act of remembering and integrating past experiences, which distort truthful reporting in retrospective cross-sectional assessments (Peters et al., 2000; Stone et al., 2004). Additional analysis revealed

that in participants on full sick leave the association was completely absent. The difference between partially and non-working burned-out participants may be explained by the fact that the items of the MBI-GS refer to the work situation (Kant et al., 2004). Therefore, we conclude that the electronic diary accurately captured the state of exhaustion in healthy controls and burned-out participants. We additionally conclude that the MBI-GS is not an adequate instrument for the assessment of exhaustion in clinically burned-out participants who are on full sick leave for a longer period of time. Considering the current study it is important to note that although the MBI-GS constituted one of our inclusion criteria, the decisive diagnostic criterion was meeting the criteria for work-related neurasthenia.

Limitations

The current study has several limitations. Six remarks have to be made about the generalizability of our samples. First, more than half of our participants (58%) held a college or university degree, indicating that this sample was more highly educated than both the general working population (35%) and mildly burned-out population (34%) (Kant et al., 2003). Although figures on education levels in clinical burnout are not available, there is little reason to expect these to diverge from mild burnout and the general population. Second, the study design was demanding, which may have discouraged participants with even more severe burnout to participate. Since we have no information on non-responders, we cannot be sure to which extent this was the case. However, the present study identified characteristics in clinical burnout as opposed to healthy participants, and thus the divergence from healthy functioning can be assumed to hold also in the severest burnout cases. Third, to avoid overexertion form traveling to the research institute we deliberately chose to limit the diagnostic procedure to assess primary and secondary psychiatric disorders to a 1-hour clinical interview. Although we have good confidence in the reliability of the diagnoses provided through this procedure a more elaborate method could have produced more fine-grained diagnostic results. Fourth, more than half of the burned-out participants were recruited through the Internet, which might have induced self-selection, hampering the generalization of the current findings. However, we consistently applied the inclusion criteria, and statistical testing did not show any differences in demographics or symptom characteristics between recruited participants through the Internet and at the treatment centre. Fifth, burned-out participants with secondary co-morbid psychopathology were included in the current study. Post-hoc testing showed no relations of co-morbid psychopathology with severity, within-person variability or diurnal patterns of exhaustion and fatigue. Including burned-out participants with secondary psychopathology did therefore not confound our results, but rather attributed to the external validity of the current study.

Sixth, concerning the healthy control group, sampling from a representative population would have been a better way of recruitment. Nonetheless, the diurnal patterns found in the control group were highly comparable to the literature as mentioned above, and we did not find conspicuous characteristics of healthy controls.

The cross-sectional nature of our study does not allow for testing whether the burned-out participants exposed a flattened diurnal pattern of fatigue before becoming ill. The outcome of longitudinal studies would have to shed light on this matter. Moreover, the burned-out participants in the current study received the label of being burned-out, which might have influenced their responses to the diary. Finally, not being at work is an important environmental difference between burned-out and healthy participants which might have influenced the assessments. Since half of our burnout sample was partially working, we were able to test whether being at work influenced the ratings of fatigue and exhaustion, but did not find such an effect. Nonetheless, a thorough investigation of situational differences might result in different findings.

Implications for practice and research

The current study revealed the daily experience of exhaustion in clinical burnout, and shows that exhaustion is severe and stable across the day. Moreover, we observed that clinically burned-out individuals experience their peak energy level during the morning. This implies that the most strenuous activities should be planned accordingly. The theory of energy erosion in burnout as developed in milder forms of burnout seems to hold in a clinical sample. This ‘empty energy tank’ can be used as point of departure in patient-education and treatment of clinical burnout.

The current study showed the value of an electronic diary method, both in research and practice: It rendered new insights in clinical burnout, as previously in other syndromes (Curran et al., 2004; Stone et al., 1994). For future research the results of the present study suggest that both fatigue and exhaustion may be assessed in burnout samples, but that fatigue is the primary variable to compare healthy and burned-out individuals. In addition, two interesting subjects emerge from the present study. The first issue concerns sleep quality and impaired recovery through sleep in relation to fatigue and exhaustion in burnout. The awareness of disturbed sleep in burnout is increasing (Melamed et al., 2006; Söderström, Ekstedt, Åkerstedt, Nilsson, & Axelsson, 2004) and the role of disturbed sleep in the etiology and maintenance of exhaustion in burnout needs further exploration. Second, it would be challenging to compare fatigue and exhaustion in participants identified as clinically burned-out with participants in whom burnout exists ‘in disguise’ (e.g. is apparent from health check-ups including the MBI-GS) while they are still fully at

work. Additionally, in spite of clinical validation studies of the MBI-GS (Roelofs et al., 2005; Schaufeli et al., 2001) one might question the use of the MBI-GS to identify clinical burnout cases on full sick leave in clinical practice as well as for research purposes. The MBI-GS exhaustion score does not accurately reflect the current state of an individual on extended absence.

Conclusion

In conclusion, we have observed the diurnal course of fatigue to be seriously inflated in clinical burnout. Therefore, the current study provides evidence for severe erosion of energy in clinical burnout. This underscores the seriousness of the syndrome and calls for effective preventive and intervention strategies.

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Chapter 4

Evidence that impaired sleep recovery may complicate burnout improvement independently of depressive mood in clinical burnout

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ABSTRACT

The paper examines recovery through sleep in relation to sleep quality, exhaustion and depression in clinical burnout. We focus on actual recovery per night given its relevance for burnout improvement. Sixty clinically burned-out participants and 40 healthy controls sampled symptoms with an electronic diary for 2 weeks at random times per day. Recovery through sleep was defined as the difference in fatigue between late evening and next morning. In clinical burnout sleep quality and recovery were impaired and depression elevated. Poor recovery through sleep was associated with poor same-night sleep quality, clarifying the mechanisms underlying poor recovery. Individual differences in recovery though sleep were related to differences in refreshed awakening, but not to other sleep problems. Impaired recovery was also related to the severity of exhaustion but not to that of depressive mood, indicating that in burnout non-profit from sleep is a symptom of energy depletion, not a sign of depression. Impaired recovery through sleep may hamper recovery from burnout independent of the influence of depression.

INTRODUCTION

Today, *clinical burnout* (1) is a wide spread health problem (2) that is costly, both personally and economically, due to its resistance to change and its insusceptibility to normal periods of rest and recuperation (2). Although burnout research was instigated by descriptions of severe cases, scientists lost sight of the dead-end of burnout, when symptoms lead to sickness absence and treatment is necessary (1). The focus shifted to milder expressions of burnout in relatively healthy employees who are still at work. In addition, most knowledge on burnout is based on research using between persons designs and still little is known about the dynamics of burnout; that is, how burnout complaints develop within persons. Therefore, the current study focuses on persons who suffer from severe burnout and uses a within subject design. The focus of the present paper is on *concurring* complaints of clinical burnout: how impaired are those with clinical burnout regarding sleep quality, recovery from fatigue through sleep, and depression as compared to healthy participants on the basis of moment-to-moment assessments? And what are the associations between these impairments?

Recovery from fatigue through sleep

At the heart of the burnout syndrome is a chronic and severe exhaustion of energy (3, 4). Exhaustion has been defined as the chronic form of acute fatigue, which is uncommon in healthy individuals. Although exhaustion levels are shown to be fairly stable across months and even years (5), acute fatigue does fluctuate within days in clinically burned-out individuals (6, 7), albeit to a lesser extent than in healthy individuals (7). Recently, an electronic diary study in burned-out individuals who were on extended sickness absence provoked the idea that sleep has lost its ability of restoring energy on a daily basis (7). The aforementioned study examined the diurnal patterns of fatigue in burnout and showed that fatigue levels after awakening of clinically burned-out and healthy participants diverged more than fatigue levels of both groups before going to sleep, suggesting that sleep does not have the same recovering effect in both groups (7). Little is known about how to reverse the energy depletion, but it seems of primary importance to find ways of reinitiating the profit from nightly rest, in order to prevent both the development and maintenance of burnout. Although sleep may not immediately effect chronic fatigue (exhaustion), small restorative effects of acute fatigue levels may accumulate in the long run and restore the chronic depletion of energy.

Disturbed sleep might contribute substantially to the limited recovery from fatigue through sleep in burnout. Sleep is found to be disturbed in clinical burnout (6, 8), and is already disturbed in the early stage of the burnout process (9-12). Like

exhaustion, these sleep disturbances – particularly non restorative sleep and trouble falling asleep (9, 12) – seem to persist in the absence of the original work stressor. To our knowledge, no attempts have been made to study lack of recovery through sleep in a clinically burned-out sample and to relate it to sleep quality. In a syndrome that bears some parallels with burnout, Chronic Fatigue Syndrome (CFS), sleep problems are prominent as well (13), and were found to be a complicating factor with respect to health recovery (14). When sleep problems do not resolve while off work, and when they hinder the onset of recovery, this may sustain the state of energy depletion.

A crucial question pertains to the role of depression in sleep problems that characterize burnout. Sleep disturbances are a sign of an episode of major depressive disorder (15, 16). Moreover, sleep disturbances increase the risk for the development of depression (17) and reduce treatment effects (18). Depression is the most prominent co-morbid psychological distress factor in burnout (19). However, preliminary evidence contradicts the idea that poorer sleep quality in burnout is due to depression. The differences in sleep disturbances between mildly high and mildly low burned-out individuals remained when accounting for depression (9). Moreover, no correlations were found between mood states and both ratings from sleep questionnaires and polysomnographic parameters. This corresponds with findings regarding CFS, where sleep problems were unrelated to depressive mood, and CFS patients with concurring psychiatric disorders did not report more sleep disturbances than CFS patients without co-morbidity (14). Considering these findings, we assume that poor recovery through sleep, just like sleep quality in both mild burnout and CFS, are not a sign of depression in clinical burnout.

Electronic diary

The usual approach to investigate the phenomena under study is by questionnaires, requesting participants to recollect and integrate past experiences and to give an overall estimation of their symptom severity. But questionnaire assessments are affected by retrospection bias, especially when assessing fluctuating symptoms (20). In the present study, prospective electronic diary monitoring according to the standards of the Experience Sampling Method (ESM; 21) and Ecological Momentary Assessment (EMA; 22) was used to establish the concurring burnout symptoms (i.e. recovery, sleep problems and depression) accurately and validly. A diary obtains direct moment-to-moment assessments of symptom severity. Consequently, this method offers the opportunity to distinguish the influence of variables on the subject-level (e.g. characteristics that distinguish between individuals such as the individual mean level of sleep quality) from within subject fluctuations of variables (for example, is sleep quality of a specific night related to recovery through sleep the following

morning, regardless of the individual mean level of sleep quality?). Moreover, this method allowed us to define and assess poor recovery through sleep as the actual difference in fatigue between late evening and next morning.

Inherent to this method is the measurement of fatigue as a general and unidimensional concept. Despite conceptual differences between physical, mental and emotional fatigue, as well as sleepiness and fatigue, in daily experience individuals cannot distinguish the different dimensions of their fatigue experience (23), and 'I am tired' is in spoken language the common expression of fatigue of any kind (24).

Hypotheses

Based on the assumption that clinically burned-out individuals recover less through sleep on a daily basis than healthy individuals, and suffer from poorer sleep quality, we formulated the following two hypotheses:

> *Hypothesis 1:* Low recovery through sleep is associated with poorer sleep quality in clinical burnout. We will explore whether burned-out individuals with overall poor sleep quality have worse recovery through sleep (*between-subject level)* and/or whether an individual who has a bad night's sleep experiences little recovery from fatigue that particular morning (*within subject-level*).
>
> *Hypothesis 2:* Low recovery through sleep is not associated with the severity of depression in clinical burnout, but with the severity of exhaustion.

METHOD

Participants

Participants were 60 clinically burned-out individuals (age $M = 42.9$, $SD = 8.75$; 55% females; 65% educated at college/university level) and 40 healthy controls, matched on age, gender and educational level. Burned-out employees were recruited from new enrollments of Dutch centers of expertise in burnout treatment (42%) and the Internet (58%) and were eligible for participation when they met the following three inclusion criteria: (1) severe burnout complaints according to validated cut-off points from the Dutch Maslach Burnout Inventory – General Survey (MBI-GS) (25) and the Checklist Individual Strength (CIS) (26); (2) extended absence and/or enrollment in professional care due to burnout symptoms, and: (3) fulfilling the criteria for work-related neurasthenia (ICD-10; 15), which has been proposed as the psychiatric

equivalent of clinical burnout (1). We allowed *secondary* psychiatric disorders to co occur with burnout, given the recent finding that 53% of severe burnout cases met DSM-IV criteria for depressive disorders (27). The Symptom Checklist-90-R (SCL-90-R; 28) served as a screening tool for severe psychopathology, and burned-out participants with a General Severity Index above 214 were excluded from the study. Subsequently, a semi-structured clinical interview (29), conducted by a senior clinical psychologist or by junior psychologists under supervision, was used to assess work-related neurasthenia and secondary co-morbid psychiatric disorders, and to exclude primary psychiatric disorders. The clinical interview consisted of a general anamnesis and the systematic assessment of, respectively, DSM-IV axis-1 disorders and work-related neurasthenia according to the ICD-10. A concurring psychiatric disorder was considered secondary when (1) exhaustion was reported to be the main complaint (and fulfilled the ICD-10 criteria for neurasthenia), (2) when exhaustion was considered by the individual as a result of chronic work stress, and (3) when the reported onset of other psychiatric disorders was more recent than that of exhaustion. Healthy controls were recruited from the community through newspaper advertisements and personal contacts. They had to be "healthy" according to validated cut-off points from the MBI-GS, the CIS and the SCL-90-R. Individuals were excluded from the study when using antidepressants, anxiolytics, corticosteroids or hormones, if pregnant, or when reporting medical conditions that could be responsible for their complaints.

All burned-out participants were on sick leave (53% full; 47% partial) for 4 months on average (SD = 3.6). Compared to the healthy controls, complaints in the burnout group were significant and at a clinical level, i.e. MBI-GS exhaustion M = 4.75 (SD = 0.99), cynicism M = 3.53 (SD = 1.34), and personal accomplishment M = 3.56 (SD = 1.31); CIS M = 106.4 (SD = 14.9). Twenty-one burned-out participants (35%) suffered from co-morbid psychiatric disorders. Most common were major depressive disorders (n = 12), that were accompanied in three cases by anxiety disorders and in one case by a somatization disorder. Other co-morbidities were anxiety disorder (n = 6), chronic pain disorder (n = 1), somatization disorder (n = 1), and adjustment disorder (n = 1). Since burned-out participants were recruited both through treatment centers and the Internet, we conducted a multivariate test between both groups on demographic variables, burnout characteristics, and diary variables under study. No significant group differences were observed ($F_{7,43}$ = 1.52, p = .19).

Procedure

A brochure, a screening questionnaire (MBI-GS, CIS, SCL-90) and a form for giving permission to be approached were sent to potential participants. When inclusion

criteria on the paper questionnaires were met, a clinical interview was conducted either at home or at the research centre. Included participants received an informed-consent form. Recruitment among burned-out participants rendered 409 respondents, of whom 289 (71%) were willing to participate and returned the screening checklist. Finally, 65 respondents (22%) met the inclusion criteria. Seventy-four supposedly burned-out individuals were excluded due to psychopathology, as reported in the screening checklist (SCL-90 > 214), and 24 individuals were excluded on the basis of the clinical interview. Sixty healthy participants responded to newspaper and Internet advertisement (n = 21) or were approached by research assistants (n = 39). Fifty healthy participants (83%) returned the screening questionnaire, of whom seven were excluded because of high age (n = 2) or MBI-GS-detected symptoms of burnout (n = 5).

The use of the Personal Digital Assistant pocket computer (PDA) and the electronic diary were explained during a 1-hour instruction session at home. Within two days, participants were inquired by phone about their first experiences and potential problems. Telephone assistance was made available during the entire recording period. The assessment period was concluded with a debriefing interview and the collection of the PDA. Of the included 108 participants, 3 clinically burned-out individuals (4.8%) retreated from the study during the first week of assessment because they considered the required effort as being too high, 1 burned-out participant and 3 healthy control participants produced unreliable data due to serious neglect of the instructions, and in 1 burnout case the data were erased due to technical problems. The study was approved by the Medical Ethics Review Committee of the Utrecht University Medical Centre.

Electronic diary measurement

Variables under study were measured with singular diary items, according to ESM premises (30), and are presented in Table 1. *Recovery* from fatigue through sleep was calculated as the difference between fatigue intensity (‘Right now I am tired’) before going to sleep and after awakening the following morning. *Sleep quality* was assessed in two separate ways: In accordance with a previous diary study of Peters et al. (31), we considered the item ‘Tonight I slept well’ as a general measure of sleep quality. Additionally, we assessed four subcategories of sleep problems according to the three main sleep difficulties in the DSM-IV criteria of primary insomnia (16), i.e. difficulty falling asleep, nocturnal awakenings, and not feeling refreshed and added to these sleep duration, in accordance with Babkoff (32).

Table 1. Diary items for exhaustion, recovery, sleep, and depression

Category	*Symptom*	*Geared by*	*Item(s)*	*Rating*	*Occurrence*
Exhaustion	Exhaustion	MBI-GS exhaustion scale	Right now I feel exhausted	7-pt scale	In all diaries
Recovery through sleep[1]	Fatigue[1]	Checklist Individual Strength	Right now I am tired	7-pt scale	In all diaries
Sleep	Sleep quality	Previous diary studies[2]	Tonight I slept well	7-pt scale	Morning diary
	Sleep duration	Babkoff (1996)	Tonight I slept for .. hours	Number	Morning diary
	Trouble falling asleep	Babkoff (1996)	Tonight I had trouble falling asleep	7-pt scale	Morning diary
	Number of sleep disruptions	Babkoff (1996)	Tonight I woke up … times	Number	Morning diary
	Refreshing sleep	Babkoff (1996)	Right now I feel refreshed	7-pt scale	Morning diary
Depression	Depressed mood	DSM-IV (49) and previous diary studies	Right now I feel depressed	7-pt scale	Alarm-controlled diary
	Enjoyment of activities	DSM-IV	Right now I enjoy what I am doing	7-pt scale	Alarm-controlled diary
	Life is worth living	DSM-IV	Today life was worth living	7-pt scale	Evening diary
	Appetite	DSM-IV	Today I had a good appetite	7-pt scale	Evening diary

Note. The 7-point scale was anchored 1 (not at all) to 7 (very much). [1] Recovery = difference of fatigue level in evening and morning diary. [2]Peters et al., 2000.

The electronic diary was programmed into a PalmOne^{TM} (PDA) using Pendragon software (33) and a separate program that generated the randomized alarms (34). Each day during 2 consecutive weeks, participants kept the electronic diary that consisted of (1) a *morning* diary after waking up, (2) an *evening* diary before going to bed and (3) an *alarm-controlled* diary at (on average) 5 random time points per day. A beeping signal was programmed to occur randomly within 2½ hour time units during the entire waking day, and prompted participants to fill in the alarm-controlled diary.

Compliance was high in both groups: 81% of all alarms was answered by a diary entry, 96% of the morning diaries and 94% of the evening diaries. For the burnout group, the study yielded a total of 3,245 alarm-controlled diaries (*M* = 55, range 26-73), 802 morning diaries (*M* = 13, range 0-16) and 797 evening diaries (*M* = 13, range 0-15); for unknown reasons one burned-out participant rendered no morning diaries and another burned-out participant rendered no evening diaries. For the control group, the number of diaries was 2,210 (*M* = 56, range 28-76), 542 (*M* = 14, range 12-15), and 520 (*M* = 13, range 7-15), respectively. Participants of both groups appreciated the method, and no reactivity effects were detected, i.e. changes in ratings of symptoms over time due to the method of diary keeping itself. The method itself is described in more detail elsewhere (35).

Statistical analysis

To examine symptom severity and the relations between symptoms, we first calculated the mean symptom intensity across all diary records for each individual, before using multilevel regression analysis.

Multilevel regression modeling (36) is recommended for ESM/EMA data because it accounts for within-subject dependencies of data points, which applies to our data, that contain multiple measurements of the same subjects (37). This method is comparable to multiple regression in that its intercept and slope parameters are analogous to the unstandardized coefficients in a regular regression analysis. Multilevel regression analysis is carried out in several consecutive steps: first, an empty model is fitted to establish the proportion of the total variance of the dependent variable (recovery) due to, respectively, differences *between* participants and those *within* participants induced by day. Subsequently, groups of variables are entered according to their level of measurement, starting with the lowest level. Because the dependent variable (recovery) is measured once a day, the lowest level in the current study is the *day level*, instead of the moment level.

After modeling the empty model (Model 1), we entered in Model 2 the severity of fatigue before going to sleep because we expected severity of fatigue in the evening to influence our measure of recovery, i.e. when fatigue is low in the evening,

little room is left for recovery, while in this case low recovery does not indicate a meaningful and alarming sign of energy depletion. Therefore, we calculated the explained variance of predictors by comparing the variance of the particular model to the variance in Model 2. We tested *Hypothesis 1* in two subsequent steps (Model 3 and 4) following the procedures as proposed by Schwarz et al. (37). In Model 3 we entered the within-person fluctuations of sleep quality, calculated as a pure within-person variable [within person daily variability of sleep quality$_{ij}$ = actual recorded sleep quality$_{ij}$ - individually aggregated mean of sleep quality$_{i}$]. Subsequently we entered the individual mean levels of sleep quality (between-person variable) in Model 4. We repeated the process of model 3 and 4 with the four subcategories of sleep problems, and entered these variables simultaneously. *Hypothesis 2* was tested in Model 5, where we simultaneously entered the aggregated individual means of exhaustion and depression. The significance of effects was determined with the Wald test: Z = *estimate* / *standard error of estimate*, where Z is referred to the standard normal distribution.

RESULTS

Affected sleep in clinical burnout

Table 2 shows differences in symptom severity between clinically burned-out and healthy participants. As assumed, clinically burned-out individuals experienced less recovery through sleep compared to healthy participants. Moreover, clinically burned-out participants reported more sleep problems (Table 2), particularly non-refreshing sleep and trouble falling asleep, while sleep duration was equal in both groups. The correlation of sleep quality and recovery was moderate (r = .50, p < .001). Eight burned-out individuals (13.3%) used sleep medication, and none of the healthy individuals (χ^2 = 5.80, df = 1, p = .02). The burned-out individuals who used sleep medication experienced shorter sleep duration (t (56) = 3.40, p = .001) and more sleep disruptions than burned-out individuals without sleep medication (t (56) = -2.18, p = .03). But differences between the healthy and clinical burnout group remained when excluding the burned-out individuals with sleep medication. Naps were more common among burned-out individuals (on average three a week compared to one in healthy individuals, t (97) = -5.47, p < .001), but were unrelated to recovery and sleep problems. Burned-out individuals did not differ from healthy participants in time of awakening (t (96) = -1.34, p = .19).

Table 2. Group differences in recovery, sleep disturbances and depression

	Group		
Diary	***Clinical burnout***	***Healthy***	***Effect***
(average intensity per individual)	(*N* = 60)	(*N* = 40)	***Size***
Recovery through sleep[a]	1.35 (1.05)	2.23 (1.37)	-0.73**
Sleep			
Sleep quality[b]	4.46 (.88)	5.39 (.79)	-1.09**
Sleep duration	7.17 (.90)	7.32 (.47)	*ns*
Trouble falling asleep[b]	3.02 (1.32)	1.95 (.85)	0.92**
Number of sleep disruptions	1.84 (1.28)	1.34 (1.09)	*ns*
Refreshing sleep[b]	3.50 (.86)	4.84 (.94)	-1.49**
Depression			
Depressive mood[b]	2.79 (1.01)	1.40 (.46)	1.66**
Enjoyment of activities[b]	4.59 (.61)	4.96 (.53)	-0.64*
Life is worth living[b]	4.96 (.92)	5.83 (.67)	-1.04**
Appetite[b]	5.26 (.94)	5.70 (.78)	-0.50*

Note. * $p < .05$; ** $p < .01$. No differences were found between burned-out participants on full and partial sick leave. [a] Difference between fatigue intensity before going to sleep and after awakening. the following morning. Fatigue was rated on a 7-point scale, ranging form *1 = not at all* to *7 = very*. [b] Scale ranges from *1 = not at all* to *7 = very*.

Sleep quality as predictor for recovery through sleep (Hypothesis 1)

To test the associations of sleep quality with recovery, on both subject level as well as day level (*Hypothesis 1)*, multilevel regression analysis was used. We wanted to examine whether poor recovery through sleep was related to the individual mean of sleep quality *(between-subject level)*, and whether daily within-person fluctuations of recovery through sleep were related to daily within-person fluctuations of sleep quality *(within-subject level)*. To calculate recovery (i.e. the morning level of fatigue subtracted from the evening level), a complete set of evening diary and the next day's morning diary was needed. Largely due to the first and last days of the measurement period, where either a morning diary or evening diary was missing, 761 of the 802 daily records of burned-out participants were used in the analyses.

Multilevel regression analysis showed that recovery differed between participants and fluctuated within participants, since 26% of the variance was attributed to the subject level and 74% of the variance was attributed to the day level. Actual testing of *Hypothesis 1* indicated a significant influence of daily fluctuations of sleep quality on recovery ($\beta_{WP\ Sleep\ Quality} = .33$, $p < .001$). Additionally, the individual

mean of sleep quality was significantly positively related to recovery as well ($\beta_{BP\ Sleep\ Quality}$ = .26, p < .001). These results indicate that within individuals sleep quality during the night was directly related to recovery of fatigue the following morning. Moreover, burned-out individuals that generally experienced low sleep quality, generally experienced poor recovery from sleep as well.

General sleep quality was significantly related to all four types of sleep problems (r ranges from ± .36 to .61, p < .001), that in turn significantly predicted sleep quality according to multilevel regression analysis (standardized beta's: sleep duration β = .26, p < .01; sleep onset β = -.20, p < .01, sleep disturbance β = .34, p < .01; non-refreshing sleep β = .38, p < .01). Directly regressing the four subcategories of sleep problems on recovery revealed that the effect of sleep quality was particularly due to non-refreshing sleep. Within a person, refreshing sleep had the strongest predictive effect on poor recovery (β = .42, p < .001), whereas trouble falling asleep had a minor effect (β = -.05, p = .005). Between individuals refreshing sleep was the only predictor for poor recovery (β = .34, p <.001).

Since non-refreshing sleep rather is an outcome of poor sleep quality than a determinant, and is strongly related to poor recovery (r = .64, p < .001), we regressed the different aspects of sleep a second time, but this time excluded refreshing sleep from the model. Within an individual, poor recovery was predicted by a shorter sleep duration (β = .14, p <.001), trouble falling asleep (β = -.08, p =.002) and more sleep disruptions (β = -.09, p =.001). At the within-person level we controlled for time of awakening, naps, mental effort and physical effort during the day prior to the night sleep. Waking up early was related to poorer recovery (β = .09 p =.002), but did not change the effects of other sleep variables. Between persons, a persistent short duration of sleep was the only sleep variable that significantly predicted poor recovery (β = .09, p =.03), but this effect disappeared when excluding the burned-out participants who used sleep medication. Thus in burned-out individuals without sleep medication, differences between persons in poor recovery are not related to any of the sleep variables. Besides sleep medication and time of awakening, we controlled for the confounding influence of several other variables on the between-person level, i.e. usual time of awakening, naps, mental effort and physical effort, and co-morbid depressive disorder (both as a predictor and while excluding those with co-morbid depression), recruitment method and full or partial sick leave. None of these variables did explain any additional variance or changed the results.

Association of poor recovery with depression and exhaustion (Hypothesis 2)

Table 2 shows that depression was more prevalent in the burned-out group than the healthy group. The most prominent difference was found for depressed mood, but

burned-out participants suffered from all four depressive symptoms that were measured. In line with our hypothesis, both recovery and sleep problems were unrelated to depression on the subject level, when calculating Pearson PM Correlations on aggregated diary scores (r = -.04, p = .79 and r = .01, p = .95, respectively) . Poor sleep quality was not related to the severity of exhaustion (r = -.12, p = .37), but higher exhaustion did relate to lower recovery through sleep (r = -.33, p = .01).

Contrary to bivariate correlations, multilevel analysis analyzed the effects of depression, partialling out (controlling for) the effects of exhaustion and sleep quality. Now, as expected and in line with the Pearson PM Correlation, recovery was negatively related to the individual average of exhaustion ($\beta_{BP\ Exhaustion}$ = -.34, p < .001), but contrary to expectations, recovery was positively related to the individual average depression ($\beta_{BP\ Depression}$ = .16, p = .01). In short, poor recovery through sleep was related to high exhaustion levels and low levels of depression.

DISCUSSION

The current study intended to clarify the manifestations of concurring symptoms in clinical burnout, in particular whether poor sleep quality is related to low recovery from fatigue during the night, and to rule out the explanation that low recovery through sleep in clinical burnout is due to depression instead of energy depletion.

Sleep quality as predictor for nightly recovery from fatigue (Hypothesis 1)

Clinically burned-out individuals did not recover as much through sleep as healthy individuals did. Burned-out participants reported all kinds of sleep problems, particularly trouble falling asleep and non-refreshing sleep, which is consistent with the literature (9, 12). Sleep duration was equal in both groups, which is in line with research among those with mild burnout and clinical burnout (6). In line with previous findings we are led to the conclusion that sleep duration is not shorter in clinical burnout, but sleep is of lower quality. Burned-out participants who were partially on sickness absence and partially working, suffered similarly from poor sleep quality and poor recovery as compared to those on full sickness absence. This might indicate that in burnout, sleep problems and lack of recovery persist independent of the original work stressor.

Poor sleep quality explained a significant part of the differences in recovery through sleep within the burnout group. Recovery was a fluctuating phenomenon within persons across days. Fluctuations in recovery within persons were predicted by fluctuations in sleep quality, in particular sleep duration, trouble falling asleep and

disruptions of sleep. In addition early awakening predicted poor recovery. These results indicate that within clinically burned-out individuals poor recovery from fatigue on a particular morning can (partially) be explained by poor sleep quality during the night. Although chronic exhaustion in clinical burnout obviously does not instantly disappear after a good night sleep, acute fatigue in burnout is responsive to nightly rest.

Between-person relations were less clear. Poor sleep quality was related to poor recovery, indicating that burned-out individuals who consistently reported poor sleep quality reported poor recovery through sleep as well. Examination of the determinants of poor sleep quality showed that not feeling refreshed in the morning was the only variable that accounted for this association. Although not feeling refreshed is an indication of poor sleep quality, it is better understood as an outcome variable like recovery, than as a determinant. Therefore we repeated the multilevel analysis with three subcategories of sleep problems and found no additional associations for burned-out individuals when controlling for the use of sleep medication. These results indicate that clinically burned-out participants who consistently felt not refreshed in the morning, truly had poor recovery through sleep. Moreover, burned-out individuals who particularly recovered poorly through sleep were not the ones who experience sleep problems. In sum: poor recovery is directly influenced by poor sleep quality, but the most impaired burned-out individuals concerning recovery are not characterized by more impairment of sleep problems except for feeling not refreshed after awakening.

Association of poor recovery with depression and exhaustion (Hypothesis 2)

Although sleep problems are one of the signs of depression, in our clinically burned-out sample, neither sleep quality nor recovery from fatigue through sleep were related to depression when calculating PM correlations on average symptom levels. When using multilevel regression analysis, we partialled out (controlled for) the effects of exhaustion and obtained different results. Our second hypothesis was partially contradicted: there *was* a significant association of recovery through sleep with the severity of depression, but instead of high levels of depression in clinically burned-out participants who do not sufficiently benefit from sleep, we found *lower* levels of depression. Moreover, low recovery was associated with higher levels of exhaustion. This suggests that the inability to benefit from sleep is a symptom of energy depletion in clinical burnout rather than a sign of depression. The current results extend the finding that depression and exhaustion are distinct phenomena – as established for mild burnout (19, 38) – to the most severe burnout cases on who are on extended sickness absence.

Since depressive mood is not similar to a co-morbid major depressive disorder, we additionally executed analyses excluding participants suffering from a concurring major depressive disorder. Differences between healthy and burned-out participants remained, in line with prior findings in both burnout (9), and CFS (14). The current results support the view that poor recovery and sleep complaints are independent concurring symptoms in burnout and should be taken into account, irrespectively of the severity of depressed mood.

Limitations

First, secondary co-morbid psychopathology was allowed in our clinical burnout sample, which could have compromised the results. Although we carefully screened whether co-morbidity was primary or secondary, the causal relation of burnout and co-morbid psychopathology might be more complex. Co-morbid psychopathology did not affect the outcomes, however. Since co-morbid psychiatric disorders are common among severely burned-out patients (27), the inclusion of these cases in fact increased the generalizability of our results. Second, participants were excluded on their subjective reports of medical conditions that could be responsible for their complaints. Although almost all burned-out participants had consulted their general practitioner and/or their occupational physician (92%), an additional and independent systematic medical examination would have been more unambiguous. Third, we did not know the intrinsic diurnal sleep-wake patterns of burned-out individuals, which might have influenced fatigue ratings in the morning. We do know that awakening time did not differ significantly between both groups, though. Fourth, our measure for recovery through sleep was based on the subjective reports of unidimensional fatigue. The current method did not allow for discerning multiple dimensions of fatigue, or discerning sleepiness and fatigue, since individuals are unable to clearly discern these states themselves (24). We must therefore acknowledge that our sampling of fatigue in the present study may include several dimensions of fatigue, as well as states of sleepiness. Finally, although we circumvented many problems of self report by sampling experiences with an electronic diary (20), the current study assessed sleep quality through self-report. Objective sleep measures have to confirm the mechanisms of sleep quality affecting recovery. Moreover, although Experience Sampling is a prospective method at the within-person level, most analyses were conducted at the between-subject level, which resembles a cross-sectional design. Obviously, longitudinal testing and experimental studies should clarify whether lack of recovery, sleep problems and depression truly complicate the course of clinical burnout.

Implications

First of all, the current findings add to the clinical presentation of clinical burnout. Both sleep problems and sub-clinical levels of depression are prominently concurring with exhaustion, but our results underscore that these problems should be assessed separately and independently. Second, persistent sleep problems in employees who still are at work might be an important early warning sign of a progressive erosion of energy. Although this issue deserves further empirical study, we suggest that sleep problems and inflated recovery from sleep are targeted in instruments for the early detection of burnout risk. Third, the present results underscore the importance of sleep management and sleep hygiene in burnout, particularly in the severe clinical cases, because evidently the sleep problems do not resolve spontaneously. We suggest that behavioral sleep medicine is actively incorporated in the treatment of burnout and cognitive behavioral therapy appears to be getting ready for the task (39).

Final note

By clarifying the relationship between poor sleep quality and low recovery through sleep in clinical burnout, the current study intends to clarify the mechanisms leading to and leading out of this severe state of energy depletion. This study intends to stimulate research among the severest burned-out cases, and to contribute to an evidence based practice of diagnosis and treatment of clinically burned-out individuals. Our expectations are raised that chronicity of burnout can be prevented.

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Chapter 5

Exhaustion and endocrine functioning in clinical burnout: An in-depth study using the Experience Sampling Method

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ABSTRACT

The current study investigates the relationship between HPA-axis functioning and burnout symptoms by employing an electronic symptom diary. This diary method circumvents the retrospection bias induced by symptom questionnaires and allows to study relationships within- in addition to between-subjects. Forty-two clinically burned-out participants completed the exhaustion subscale of the Maslach Burnout Inventory and kept an electronic diary for 2 weeks to assess momentary exhaustion and daily recovery through sleep. On 3 consecutive weekdays within the diary period, saliva was sampled to determine the cortisol awakening response (CAR), levels of dehydroepiandrosterone-sulphate (DHEAS) on the first 2 weekdays, and to conduct the dexamethasone suppression test (DST) on the 3rd weekday. We found significant relationships between endocrine values and general momentary symptom severity as assessed with the diary, but not with the retrospective questionnaire-assessed burnout symptoms. Simultaneous assessments of endocrine values and burnout symptoms assessed with the diary after awakening rendered significant associations between persons, and a trend within persons. More severe burnout symptoms were consistently associated with a lower level and smaller increase of CAR, higher DHEAS levels, smaller cortisol/DHEAS ratios and a stronger suppression after DST. Burnout symptoms were significantly related to endocrine functioning in clinical burnout under the best possible conditions of symptom measurement. This adds support to the view that severity of burnout symptoms is associated with HPA-axis functioning.

INTRODUCTION

Burnout is a syndrome of severe energy depletion, dysfunctional attitudes towards the job and a lack of professional efficacy due to chronic stress at work (Maslach et al., 2001). The severity of exhaustion, its resistance to change and its insusceptibility to rest suggest a physiological deregulation in burnout (Melamed et al., 2006). Since the Hypothalamus Pituitary Adrenal axis (HPA-axis) is the central stress-physiological system for the long term adaptation of an organism to stress (Cook, 2002; Sapolsky et al., 2000), and burnout is supposed to be the result of chronic work stress, most studies on the physiology of burnout have focused on this physiological system (Raison and Miller, 2003). Heim et al. (2000) suggested a state of hypocortisolism to be associated with stress-related bodily disorders. The fatigue symptoms of burnout (i.e. exhaustion) resemble the severe fatigue in chronic fatigue syndrome (CFS). CFS is, if anything, characterized by a slight hypofunctioning of the HPA-axis, i.e. lower cortisol levels and an increased feedback sensitivity (Cleare, 2003, Heim et al., 2000, Parker et al., 2001). Although the HPA-axis has been associated with stress (Sapolsky et al., 2000), depression (Holsboer, 2001), and fatigue (Cleare, 2003), between group studies on burnout have produced inconsistent results. In relatively healthy employees with mild burnout symptoms who are still working (mild burnout), both elevated cortisol levels during the day (Melamed et al., 1999) and lower levels after awakening (Pruessner et al., 1999) have been found as compared to healthy controls. In more strongly affected individuals on sickness absence or in clinically diagnosed burned-out cases both lower (Mommersteeg et al., 2006a) and higher (De Vente et al., 2003; Grossi et al., 2005) salivary cortisol levels after awakening have been found as compared to healthy controls, but an absence of cortisol deviations has also been reported (Mommersteeg et al., 2006b).

A less common way to examine the association between burnout and HPA-axis functioning is looking at relationships between symptom severity and endocrine measures within a group of affected persons. The few studies performed, however did not find any significant relationships between severity of burnout symptoms and cortisol levels. A study among 48 employees rendered non significant correlations between evening salivary cortisol and scores on a burnout questionnaire (Galantino et al., 2005). In clinical burnout samples no relationships were found between a burnout questionnaire and the cortisol awakening response, the day-curve and dexamethasone-suppressed cortisol levels (Mommersteeg et al., 2006a; Mommersteeg et al., 2006b).

The common way to measure symptoms in burnout research, as in all aforementioned studies, is retrospectively by questionnaires. Participants are asked

to remember and integrate recent experiences of symptoms and make the best possible estimate of the general severity of their symptoms. Unfortunately, questionnaires produce retrospection bias, which restricts the accuracy of the symptom assessments (Bolger et al., 2003; Fahrenberg et al., 2001; Houtveen and Oei, in press; Hufford et al., 2001; Robinson and Clore, 2002). Rating the past rather than the present induces, for example, the tendency to report more negative emotions and to stay nearer to the scale midpoint (Fahrenberg et al., 2001). Moreover, retrospective assessments are strongly influenced by peak experiences, current state and personal semantic memories (Fahrenberg et al., 2001; Hufford et al., 2001; Robinson and Clore, 2002). A more accurate way to assess symptom severity is to measure symptoms right at the moment they are experienced. When aggregating these momentary assessments over several moments and days, a more reliable estimate of general symptom severity is acquired in comparison to retrospective questionnaires over the same time period. For this purpose, electronic diary methods like the Experience Sampling Method (ESM; Csikszentmihalyi and Larson, 1987) have been developed (Bolger et al., 2003). The present study seeks to improve the methodology to investigate relationships between HPA-axis function and symptoms in clinical burnout by employing ESM.

The aggregated value of ESM symptom assessments offers an estimate of the general severity of complaints during, for example, 2 weeks (i.e. like retrospective questionnaires do). But ESM allows us to relate cortisol to symptom levels right at the moment of cortisol sampling as well, in our case: the moment after awakening. Cortisol levels show intra-individual variations between days, and therefore it is common practice to sample cortisol across several days to increase the reliability of between-subject comparisons (Pruessner et al., 1997). However, within-person variations of cortisol levels across days may reflect meaningful situational effects, and aggregating momentary assessments means ignoring these effects and loosing important information (Hruschka et al., 2005). Studies using ambulatory measurement of both physiological and psychological measures have revealed that there may be a relationship between fluctuations of variables *within* an individual. For example, there is ample evidence showing that state negative affect is positively associated within individuals with cortisol levels sampled at the same moment (Hanson et al., 2000, van Eck et al., 1994, van Eck et al., 1996a, van Eck et al., 1996b, Symth et al., 1998, Adam, 2006a). In other words, cortisol levels are higher when an individual experiences more negative affect, and lower when the same individual experiences less negative affect in proportion to his own mean levels of cortisol and negative affect. Momentary within-person relationships may be found irrespective of between-person relationships. Therefore negative results of between-person relationships of cortisol and exhaustion, even at the same moment,

may wrongfully lead to the conclusion that no relationship exists between cortisol and symptoms. Since exhaustion and poor recovery through sleep fluctuate within individuals (Sonnenschein et al., in press a,b), and cortisol shows intra-individual variability, it may be that these fluctuations cohere. As far as we know, the current study is the first to differentiate between- and within-person relationships of same moment assessments of exhaustion and cortisol in clinical burnout.

Burnout has been defined as a three-dimensional syndrome, that becomes apparent at work through exhaustion, cynicism towards work and reduced professional efficacy (Maslach et al., 2001). Since our sample consisted of participants on sick leave due to burnout symptoms, we focused our study on exhaustion, which persists as a daily experience once on sick leave (for example, see Mommersteeg et al., 2006a). Exhaustion has long been recognized as burnouts core symptom, but we are aware that burnout can not be reduced to mere exhaustion (Maslach et al., 2001). Closely related to exhaustion experience itself, is our earlier observation that daily fatigue in burned-out individuals does not respond to sleep, as in healthy individuals (Sonnenschein et al., in press b). Therefore, we will relate cortisol functioning to poor recovery through sleep in addition to straightforward symptom reports of exhaustion.

HPA-axis functioning can be investigated through several parameters. In the current study we therefore considered the following three parameters. First, the cortisol awakening response (CAR), the immediate rise of cortisol levels within 30 min after awakening (both level and increase). Second, dehydroepiandrosterone-sulphate (DHEAS), an adrenal hormone released in response to ACTH. DHEAS levels are hypothesized to deviate in stress-related syndromes (Kroboth et al., 1999; Wolf and Kirschbaum, 1999). DHEAS differs from cortisol in that it shows actions opposite to the regulatory effects of cortisol (Chen and Parker, 2004). Therefore the cortisol/ DHEAS-ratio was assessed as well. And last, we considered the feedback sensitivity of the HPA-axis by conducting the dexamethasone suppression test (DST; De Kloet, et al., 1998). The synthetic glucocorticoid dexamethasone that participants take, mimics the negative feedback effect of cortisol. After a low dose of dexamethasone (0.5 mg) the cortisol level is reduced, but not completely, allowing the detection of subtle individual differences in feedback function.

Summarizing, we investigate the association between energy depletion in clinical burnout and indicators of HPA-axis functioning in a reliable and in-depth way through ESM symptom assessments. Preparatory to the research issue 1, the difference between ESM and retrospective questionnaire assessment of burnout symptoms will be demonstrated by examining the relations between both methods (*preparatory issue a).* Subsequently we will examine whether the general severity of exhaustion and recovery through sleep are associated with the CAR, DHEAS and

DST in clinical burnout by using a retrospective questionnaire (*research issue 1a)* and by using 2-week aggregated diary assessments (*research issue 1b)*. Preparatory to research issue 2 we will demonstrate that burnout symptoms and cortisol levels fluctuate within clinically burned-out individuals (*preparatory issue b).* Lastly, we examine whether same-moment assessment of exhaustion and recovery through sleep (i.e. after awakening) are associated with morning cortisol levels between persons (*research issue 2a)* and within persons (*research issue 2b)*.

METHOD

Participants

Burned-out employees on sick leave were recruited from new enrollments of Dutch centers of expertise in burnout treatment and from the Internet. Two-hundred and ninety-three individuals responded to the call, of whom 209 (71%) were actually willing to participate and returned the screening checklist. Individuals were eligible for participation when they met the following inclusion criteria: 1) severe burnout complaints according to validated cut-off points from the Dutch Maslach Burnout Inventory - General Survey (MBI-GS; exhaustion ≥ 2.20, and either cynicism ≥ 2.00 or personal accomplishment ≤ 3.67; Schaufeli and Van Dierendonck, 2000) and the Checklist Individual Strength (CIS; total score ≥ 76; Bültmann et al., 2000), 2) extended absence and enrollment in professional care due to burnout symptoms, and 3) fulfilling the criteria for ICD-10 work-related neurasthenia (WHO, 1993), which has been proposed as the psychiatric equivalent of clinical burnout (Schaufeli et al., 2001). We allowed secondary psychological disorders to co occur with burnout. A semi-structured clinical interview (Hoogduin et al., 1999), conducted by a senior psychologist or by junior psychologists under supervision, and the Symptom Checklist-90-R (SCL-90-R, general severity index < 214; Arrindell and Ettema, 2002) were used to assess work-related neurasthenia and secondary co-morbid psychiatric disorders, and to exclude primary psychiatric disorders. We excluded individuals who suffered from primary psychiatric disorders, individuals who used antidepressants or anxiolytics, or if pregnant. Finally, 47 respondents (22%) met the inclusion criteria. Unfortunately, 3 participants (6.4%) retreated from the project during the first week of assessment, 1 produced unreliable data due to serious neglect of the instructions, and for 1 participant the data were erased due to technical problems.

The final sample consisted of 42 clinically burned-out individuals, 24 women and 18 men, on average 42.7 years old (*SD* = 8.3) and highly educated (52.4% held a college or university degree). All participants were on sick leave (*M* = 14.3 weeks, *SD* = 14.1) and experienced complaints longer than 6 months (*M* = 26.1 weeks, *SD*

= 22.8). Sixteen participants (38.1%) suffered from co-morbid psychiatric disorders, mainly from depressive disorder (*n* = 9), which was accompanied in 3 cases by an anxiety disorder and in one case by somatization disorder. Other co-morbidities were anxiety disorder (*n* = 6) and chronic pain disorder (*n* = 1).

Measures

Questionnaire

Exhaustion was measured using the exhaustion subscale of the Dutch version of the Maslach Burnout Inventory - General Survey (MBI-GS or in Dutch UBOS; Schaufeli and Van Dierendonck, 2000). High scores on this subscale are indicative for burnout, and the score can range from 0 = *never* to 6 = *every day*. The internal consistency of the subscale was high (Cronbach's α = .95).

Electronic diary (ESM)

The electronic diary was programmed into a PalmOne^{TM} Personal Digital Assistant computer (PDA) using Pendragon software (Pendragon Software Corporation, 1998) and a separate program that generated randomized alarms (Houtveen, 2002). During 14 days, participants kept the electronic diary every morning after waking up (morning diary), before going to bed (evening diary) and on average at 5 random time points per day (alarm-controlled diary). An alarm was programmed to occur randomly within 2½ hour time units during the entire waking day, and prompted participants to fill in the alarm-controlled diary. The diary items appeared one by one, and the items could be answered through tapping the soft-touch screen of the PDA with a stylus. Compliance was high, since 82% of all alarms was answered by a diary entry, and 94% of the morning diaries and 93% of the evening diaries were completed. The study yielded a total of 2,276 alarm-controlled diaries (*M* = 56, range 26-73), 557 morning diaries (*M* = 13, range 0-16) and 552 evening diaries (*M* = 13, range 0-15). Burned-out participants appreciated the method well, and no reactivity effects were detected, i.e. changes in ratings of symptoms over time due to the method of diary keeping itself. More detailed information on the feasibility of ESM in clinical burnout, and information on the method itself is described elsewhere (Sonnenschein et al., 2006).

Variables under study were measured according to ESM premises: with singular diary items that measure states instead of constructs, mimic an internal dialogue, and are short and easy to comprehend (Delespaul, 1995). *Exhaustion* was measured by the statement 'Right now I feel exhausted', based on the MBI-GS exhaustion item 'I feel mentally exhausted from my work' (factor loading of .75; Schaufeli and Van Dierendonck, 2000). We generalized the exhaustion item since

individuals were on extended sick leave, and simplified it according to ESM premises. Answers were given on a 7-point scale anchored 1 = *not at all* to 7 = *very much*. *Recovery through sleep* was calculated as the difference between fatigue intensity before going to sleep and when waking up the following morning. The item 'Right now I am tired', was formulated to measure fatigue intensity, based on the high loading item 'I feel fatigued' of the CIS-subscale 'Subjective fatigue' (factor loading of .75; Vercoulen and Bleijenberg, 1999).

Endocrine parameters

To assess the cortisol awakening response (CAR) participants collected saliva on two consecutive weekdays upon awakening (0 min), and 15 and 30 min after awakening, by soaking a cotton role with saliva and saving it in a plastic tube (Sarstedt, Etten-Leur, The Netherlands). Participants collected saliva within the 2-week period of diary measurement and started with cortisol sampling on average on the 6th day of the 2 week period (*SD* = 3.6 days). They were instructed not to brush their teeth, eat or drink coffee from awakening until the last saliva sample. Dehydroepiandrosterone-sulphate (DHEAS) was assessed on the same days as CAR measurement. Participants collected an extra saliva sample via passive drool (Shirtcliff et al., 2001), immediately after taking the last saliva sample (30 min after awakening). CAR level (ground) and CAR increase (slope) were examined separately. To conduct the dexamethasone suppression test (DST), participants took an oral dose of dexamethasone (0.5 mg, PO) at 22:30 in the evening on the 2nd day of saliva collection for CAR assessment, and a reminder was programmed in the electronic evening diary. On the 3rd morning, again three saliva samples were collected (0, 15 and 30 min) to determine the dexamethasone-suppressed cortisol levels. During the collection period all cortisol samples were kept at 4^{o} C. After non-cooled transport, the samples were stored at -20^{o} C at the research centre. The cortisol samples were analyzed using a chemiluminescence assay (LIA), as described elsewhere (www.ibl-hamburg.com). The salivary DHEAS measurements were done with a kit from Diagnostic Systems Laboratories (DSL) (http://www.dslabs.com/). The intra- and interassay variability was less than 10%.

Procedure

An information brochure about the research project, a screening questionnaire (including scales of the MBI-GS, CIS, and SCL-90-R) and an informed-consent form were sent to potential participants, either on paper or via e-mail. When meeting the inclusion criteria on the questionnaires, a clinical interview was conducted. After inclusion, a 1-hour instruction at home was given to explain the use of the electronic diary, as well as the collection of saliva. Participants kept the diary for 2 weeks and

collected saliva on 3 consecutive weekdays within the 2-week diary period. Within 2 days after instruction, participants were inquired by phone about their first experiences and potential problems. Telephone assistance was made available during the entire recording period. The assessment period was concluded with a debriefing interview and the collection of the PDA and saliva samples. The study was approved by the medical ethics review committee of Utrecht University Medical Centre.

Statistical analysis

Two-week aggregates of diary assessments were obtained by calculating the mean of all available records per individual. The cortisol/DHEAS ratio was calculated by dividing the mean of the three cortisol samples after awakening by the DHEAS level. We used the log 10 transformation of DHEAS levels and cortisol/DHEAS ratios in analyses because of the skewed distribution of values. To examine *preparatory issue a* and *preparatory issue b* we calculated Pearson PM correlations using SPSS 12.0. Next, we examined associations between burnout symptoms and endocrine measures (*research issues 1a, 1b, 2a and 2b*) with multilevel regression modelling using MlwiN 2.02. Multilevel regression modelling is recommended for within-subject analyses because it accounts for within-subject dependencies of data points, and can discern on which level (i.e. subject, day or sample level) variance is explained by the independent variable (Hruschka et al., 2005). This method is comparable to multiple regression analysis in that its intercept and slope parameters are analogous to the unstandardized coefficients in a regular regression analysis. The multilevel regression equations can be found in the appendix. In all cortisol analyses we controlled for the influence of time of measurement (0, 15 or 30 min after awakening).

Additional analyses were performed with exclusion of negative CARs, to rule out the effect of non-compliance (Kudielka et al., 2003). A negative CAR may indicate that the participant did not sample cortisol directly after awakening, and therefore 'missed' the CAR. We did not perform this additional analysis for the DST, since DST suppresses the CAR itself. In total 21.4% of the CARs showed a negative slope either on day 1 or day 2. All analyses were rerun with the exclusion of individuals with co-morbid psychopathology. Depressive symptoms are thought to be related to a hyperactive HPA-axis, with overall higher levels and a reduced sensitivity for dexamethasone (Parker et al., 2003). Despite recent findings of an absence of fatigue and depression effects on cortisol function in burnout (Mommersteeg et al., 2006b), we performed these analyses to rule out that associations were due to co-morbid psychopathology instead of burnout. Sixteen persons suffered from co-morbid psychopathology, mainly mood and anxiety disorders.

RESULTS

Table 1 presents descriptive data on symptoms and endocrine values in the clinical burnout sample.

Table 1. Means (*SD*) of burnout symptoms and endocrine measures in clinical burnout (n = 42)

Burnout symptoms					
	Questionnaire	Diary (ESM)			
Variables		2-week aggregate	Day 1	Day 2	Day 3
Exhaustion	4.71 (1.02)	3.41 (.91)	3.38 (1.50)	3.41 (1.42)	3.26 (1.80)
Recovery	.	1.19 (1.06)	0.95 (1.84)	1.06 (1.95)	1.33 (1.45)
Endocrine measures					
Variables	Sampling moment (min after awakening)	Aggregate (day 1 and 2)	Day 1	Day 2	Day 3 DST
Cortisol [nmol/l]	0	15.09 (5.91)	15.30 (7.51)	14.87 (7.24)	0.94 (1.01)
	15	19.76 (7.31)	21.07 (9.62)	18.57 (7.52)	1.04 (1.74)
	30	21.57 (8.33)	22.51 (9.32)	20.66 (9.89)	1.55 (2.59)
DHEAS [ng/ml]	30	3.25 (2.79)	2.85 (2.79)	3.26 (2.91)	.
Cortisol/DHEAS ratio		15.39 (21.56)	15.06 (20.37)	14.41 (19.81)	.

Note. The ESM assessments of day 1, 2 and 3 concern the three consecutive cortisol sampling days, and represent the values of exhaustion in that particular morning diary and recovery that morning (i.e. fatigue in that morning diary subtracted from fatigue in the preceding evening diary). Cortisol measurements on the third day were influenced by dexamethasone intake, i.e. the Dexamethasone Suppression Test (DST).

Correlation between retrospective questionnaire and diary measurement of exhaustion (preparatory issue a)

To identify to what extent ESM assesses symptoms in a different way than questionnaires do, we established the relationship between exhaustion severity as measured by a questionnaire, the MBI-GS exhaustion scale, and the individual mean level of exhaustion as assessed during 2 weeks of ESM diary recording. Questionnaire and ESM assessments of exhaustion were moderately related (r = .46, p =.07[3]). The questionnaires were filled out 4 days before the diary recording

[3] This correlation was calculated solely on participants on partial sick leave who had partially resumed work (n = 17), due to low validity of the MBI-exhaustion scale in employees on full sick leave (Sonnenschein et al., 2006a).

period (*SD* = 11.7). To control for the time lag between questionnaire and diary assessments we calculated a partial correlation (partialling out time lag) and found similar results (r = .49, p =.05). Thus as expected, only a moderate relationship was found between questionnaire and ESM assessment of exhaustion.

Associations between symptoms and endocrine values

Tables 2a and 2b show the strength of the relationship between burnout symptoms and endocrine measures expressed in standardized b-coefficients calculated with multilevel regression analyses. The β-coefficients express the ability of burnout symptoms to statistically predict the HPA-axis parameters. We accounted for the confounding influence of time of awakening, depressive mood, sleep quality, BMI, smoking, oral conceptive usage, age, gender and partial or full sick leave. We additionally ran every analysis excluding (a) negative CARs and (b) without participants that suffered from co-morbid psychopathology.

The questionnaire and cortisol parameters (research issue 1a)

We found no significant associations between questionnaire assessment of exhaustion, the MBI-GS exhaustion scale, and endocrine measures (Table 2a). Additional analyses, subsequently excluding samples without a CAR increase and participants that suffered from co-morbid psychopathology, did not change these results.

General symptom severity assessed with ESM and cortisol parameters (research issue 1b)

Second, we examined the associations of HPA-axis parameters with 2-week aggregated scores of burnout symptom assessments with the diary. We found two significant associations and three trends shown in Table 2a: Higher exhaustion levels were associated with a decreased level of cortisol after intake of dexamethasone (DST CAR level), a smaller rise after dexamethasone intake (DST CAR increase), and higher levels of DHEAS as well as lower cortisol/DHEAS ratios. Burned-out individuals who were characterized by generally poor recovery through sleep showed lower cortisol levels after awakening (CAR level). The amount of explained variance of these findings varied between 3% and 16%, with the exception of exhaustion that explained 30% of the variance in CAR increase after dexamethasone intake (DST CAR increase).

After excluding samples without a CAR increase for the assessments on day 1 and 2, the association between the aggregated value of poor recovery through sleep and a lower CAR level remained (β = .27, p <.05). When excluding participants

that suffered from co-morbid psychopathology no associations remained significant, even the strong association between exhaustion and DST CAR increase.

Table 2a. Associations (β) between endocrine measures and general symptom severity in clinical burnout

	Assessment of endocrine measures		***General symptom severity*** Questionnaire	Diary[1] (ESM)	
Endocrine measure	Day	Min after awakening	Exhaustion (β)	Exhaustion (β)	Recovery (β)
CAR level	1,2	0, 15, 30	.06	-.14	.27*
CAR increase	1,2	0, 15, 30	-.13	-.33	.13
DHEAS[2]	1,2	30	-.01	.26^{+}	-.09
Cortisol /DHEAS ratio[2]	1,2	30	.09	-.26^{+}	.16
DST CAR level	3	0, 15, 30	.01	-.26^{+}	-.15
DST CAR Increase	3	0, 15, 30	.17	-.69**	-.16

Note. $^{+}$ $p < .10$; * $p < .05$; ** $p < .01$; The significance of effects was determined with the Wald test: Z = *estimate* / *standard error of estimate*, where Z is referred to the standard normal distribution. [1] Two-week aggregated score. [2] DHEAS values and the cortisol/DHEAS ratio were log 10 transformed.

Table 2b. Associations (β) of endocrine measures and same-moment symptom assessments in clinical burnout

	Assessment of endocrine measures		***Same-moment symptom assessments*** BP[1]		WP[1,3]	
Endocrine measure	Day	Min after awakening	Exhaustion (β)	Recovery (β)	Exhaustion (β)	Recovery (β)
CAR level	1,2	0, 15, 30	-.27*	.38***	-.14^{+}	-.10
CAR increase	1,2	0, 15, 30	-.37*	-.13	-.10^{+}	-.03
DHEAS[2]	1,2	30	.25	-.04	-.10	.01
Cortisol /DHEAS ratio[2]	1,2	30	-.39**	.27^{+}	.01	-.07
DST CAR level	3	0, 15, 30	-.04	.08	.	.
DST CAR Increase	3	0, 15, 30	-.18	-.20	.	.

Note $^{+}$ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$; The significance of effects was determined with the Wald test: Z = *estimate* / *standard error of estimate*, where Z is referred to the standard normal distribution. [1] BP = between person variability of the symptom, WP = within-person variability of the symptom . [2] DHEAS values and the cortisol/DHEAS ratio were log 10 transformed. [3]The dexamethasone suppression test (DST) was only performed once. Therefore, no within-person associations were calculated for DST CAR level and DST CAR increase.

Fluctuations of symptoms and endocrine measures across days (preparatory issue b)

The three morning assessments of exhaustion were intercorrelated moderately (Table 3). The three morning assessments of recovery through sleep did either not correlate or correlated moderately, as did the two morning assessments of cortisol and DHEAS. Since relationships between measurements are moderate, symptoms and endocrine measures seem to fluctuate between days within individuals.

Table 3. Intercorrelations of assessments across days

Category	***Variable***	***Days***		
		1-2	2-3	1-3
		r	*r*	*r*
Burnout symptoms				
(*n* ranges from 35 to 42)	Exhaustion	.38*	.40*	.64**
	Recovery	.22	.49**	.05
Endocrine measures				
(*n* ranges from 38 to 42)	Cortisol			
	0 min	.30		
	15 min	.45*		
	30 min	.53**		
	DHEAS	.26		
	Cortisol/DHEAS ratio	.49**		

Note. * $p < .05$; ** $p < .01$Day 1, 2 and 3 concern the 3 consecutive cortisol sampling days. The burnout symptoms are assessed in the morning diary. No correlations are calculated for the 3rd day, since this sample was influenced by the dexamethasone suppression test (DST).

Same-moment assessment, between-person associations (research issue 2a)

We analyzed the associations of cortisol and DHEAS with the *individual 2-day average* level of same-moment exhaustion and recovery through sleep (between person association or BP). BP-exhaustion was significantly associated with a lower level of cortisol (CAR level) and with a smaller cortisol/DHEAS ratio (Table 2b). BP-recovery was as well significantly associated with a lower CAR level and a trend appeared for a smaller cortisol/DHEAS ratio. In addition, BP-exhaustion was associated with a smaller CAR increase. The amount of explained variance of the significant results varied between 4% and 12%.

Higher BP-exhaustion and poorer BP-recovery remained significantly associated with lower CAR levels when excluding samples without a CAR increase (β = -.25, *p* <.05 and β = .33, *p* <.05) and individuals with co-morbid psychopathology (β = -.18, *p* <.10 and β = .32, *p* <.05). The cortisol/DHEAS ratio only remained significantly related to BP-exhaustion when excluding samples without a CAR increase (β = -.31, *p* <.10), but not after exclusion of co-morbidity). The smaller CAR increase remained associated with higher BP-exhaustion when excluding co-morbid psychopathology (β = -.49, *p* <.10).

Same-moment assessment, within-person associations (research issue 2b)
A trend appeared for the association of within-person fluctuations of symptoms (WP) across days (day 1 and 2) with endocrine, as shown in Table 2b: a lower CAR level and smaller CAR increase were observed on days with higher exhaustion levels after awakening (WP-exhaustion). The amount of explained variance varied between 2% and 7%.

When excluding samples without a CAR increase none of the associations remained and without co-morbid psychopathology only one association remained, i.e. higher levels of WP-exhaustion were still significantly associated to a smaller CAR increase (β = -.15, *p* <.05).

DISCUSSION

We conducted an in-depth study on relationships between HPA-axis functioning and burnout symptoms in clinically burned-out individuals. Instead of retrospective questionnaires, we used an electronic diary according to the Experience Sampling Method (ESM) to assess momentary burnout symptoms, and thereby improved symptom assessments.

In a clinically burned-out sample we found no associations between general severity of exhaustion assessed with a retrospective questionnaire and endocrine values (*research issue 1a*), but we did find associations of endocrine values with ESM assessments of general severity of exhaustion and poor recovery through sleep (*research issue 1b*). Burned-out individuals with a higher general severity of exhaustion and poor recovery through sleep in the diary displayed lower cortisol levels, higher DHEAS levels, and consequently a smaller cortisol/DHEAS ratio, as well as a stronger suppression of cortisol after DST. All of these findings consistently indicate a hypoactive HPA-axis. Our findings confirm prior research that did not find any significant relationships between retrospective burnout questionnaires and the cortisol awakening response, the day-curve, dexamethasone-suppressed cortisol

levels (Mommersteeg et al., 2006a; Mommersteeg et al., 2006b) and evening cortisol levels (Galantino et al., 2005). However, we did find associations between general severity of momentary symptoms assessed with the diary. Moreover, we showed that the diary taps other information than the questionnaire, i.e. the moderate relationship between both assessment methods (*preparatory issue a*). Moderate correlations between retrospective and momentary assessments are commonly found, and mainly attributed to the cognitive processes used in retrospective assessments that distort truthful reporting (Peters et al., 2000; Stone et al., 2004). Therefore, the difference between previous questionnaire research and the current findings using ESM should probably be attributed to the more reliable way of assessing general symptom severity with ESM.

Our presumption that burnout symptoms and endocrine values fluctuate within individuals across days was confirmed (*preparatory issue b*). Endocrine values were significantly associated with same-moment assessments of burnout symptoms between individuals (research issues 2a) and a trend was found within individuals (research issues 2b). In other words, burned-out individuals with *generally* higher exhaustion and poorer recovery through sleep in the morning (BP) showed lower levels and smaller increases of cortisol values after awakening, and a smaller cortisol/DHEAS level accordingly (between-person association). Independent of the *general* level of symptoms after awakening, days with higher symptom severity (WP) were associated (a trend) with lower CAR levels and slopes and lower CAR levels after dexamethasone intake compared to days with lower symptom severity (within-person association). Though the latter became non-significant after excluding participants with co-morbid psychopathology (but see comment below). These findings are signs of a hypofunctioning of the HPA-axis between and probably also within individuals. To our knowledge, the current study is the first to show that within-person relationships seem to correspond with between-person relationships of exhaustion and cortisol in clinical burnout.

The between-person associations of endocrine values with the average morning levels of symptoms were more robust than associations with the general severity of symptoms and within-person associations. Most significant associations remained for between-person association of same-moment assessments when excluding negative CARs or co-morbid psychopathology. But most significant associations or trends disappeared for general severity of symptoms and for the within-person level of same-moment assessments. On the whole, the additional analyses excluding co-morbid psychopathology have probably been too conservative (i.e., a low statistical power), since the already small *N* dropped from 42 to 26. The additional analyses excluding samples without a CAR increase suffer the same problem, although to a lesser extent. Besides, higher exhaustion was consistently

associated with a lower CAR increase, and therefore, excluding samples without a CAR increase implied excluding samples and/or individuals with higher exhaustion levels. It might be, but seems unlikely, that burned-out individuals with higher exhaustion are less compliant than burned-out individuals with lower exhaustion. In contrast, the remaining associations of high exhaustion/poor recovery with a lower CAR level after exclusion of negative CAR samples indicate that excluding samples with a negative CAR might have been too conservative as well.

We showed that in a group of burnout patients there is some (between and within) association between severity of symptoms of exhaustion and non recovering sleep on the one hand and HPA hypofunctioning on the other. In the light of these observations one would predict also to find this tendency when comparing a group of clinical burnouts with a healthy control group. Surprisingly the literature is inconsistent in this respect. Several studies in CFS showed that a lack of energy is associated with a hypofunctioning of the HPA-axis (Cleare, 2003; Jerjes et al., 2005; Parker et al., 2001; Roberts et al., 2004; Scott and Dinan, 1998). Though inconsistencies in these studies were reported as well (Gaab et al., 2002; Jerjes et al., 2006; Young et al., 1998). A between group diary study of burned-out and healthy individuals would reveal whether the earlier inconsistent findings are due to a too rough measurement of symptoms by questionnaires.

The within-persons trend found in the relationships between exhaustion and endocrine measures is in the same direction as the observed between-person relationships. Although the within-person relationships seem less important and can be best considered as preliminary since we assessed only 2 days, they indicate a direct relationship between HPA-axis functioning and exhaustion, irrespective of general level of exhaustion. It might as well be that this observation holds in other populations that are not characterized by severe exhaustion. For example, low wakeup cortisol in older adults predicted higher levels of fatigue later that day (Adam et al., 2006b).

This study has several limitations. First, our sample size was limited to 42 participants and 2 days of CAR and DHEAS measurement and 1 dexamethasone suppression test. This might have particularly influenced the analyses in which participants were excluded, based on the flat CAR curves and the exclusion of the participants with co-morbid psychopathology. The moderate correlation between questionnaire and diary assessment of exhaustion might be partially explained by the time lag between questionnaire and diary assessment, although no direct confounding influence of time lag on the association was found. As questionnaires usually refer to describing a previous period, an additional retrospective questionnaire at the end of the sampling period is recommended for future studies.

The new and in-depth findings of the current study ask for a more elaborate replication, in particular with an extension of cortisol sampling days. Moreover, using a diary study might clarify the inconsistent findings often found in between group studies. In general, electronic diary measurement of symptoms is an important contribution to health-related research. The method has the power to shed new light on inconsistent findings from previous retrospective studies, or to substantiate these with sound proof. The current results advocate same-moment assessments when examining symptom-cortisol associations, instead of general symptom severity.

To conclude, the current study adds support to the view that the severity of burnout symptoms is associated with HPA-axis functioning.

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Appendix. Multilevel regression equations

Research issue 1 (Table 2a)

Dependent variables	*Equation*	*Level of R^2*
CAR level:	$Cortisol_{ijk} = Intercept_{ijk} + Time_{ijk} + \underline{\beta\ Symptom_i}$	Subject
CAR increase[1]:	$Cortisol_{ijk} = Intercept_{ijk} + random\ Time_{ijk} + Symptom_i + \underline{\beta\ Time*Symptom_{ijk}}$	Random part subject variance
DHEAS:	$logDHEAS_{ij} = Intercept_{ij} + \underline{\beta\ Symptom_i}$	Subject
Cortisol/DHEAS ratio:	$logCDratio_{ij} = Intercept_{ij} + \underline{\beta\ Symptom_i}$	Subject
CAR dex level:	$Cortisol_{ik} = Intercept_{ik} + Time_{ik} + \underline{\beta\ Symptom_i}$	Subject
CAR dex increase[1]:	$Cortisol_{ik} = Intercept_{ik} + random\ Time_{ik} + Symptom_{\underline{i}} + \underline{\beta\ Time*Symptom_{ik}}$	Random part subject variance

These equations were tested for three different independent variables (Symptom): 1) MBI-exhaustion score (research issue 1a); 2) 2-week aggregated diary score of exhaustion (research issue 1b); 3) 2-week aggregated diary score of recovery through sleep (research issue 1b).

Research issue 2[2] (Table 2b)

Dependent variables	*Equation*	*Level of R^2* (BP/WP)
CAR level:	$Cortisol_{ijk} = Intercept_{ijk} + Time_{ijk} + \underline{\beta\ BP\text{-}Symptom_i} + \underline{\beta\ WP\text{-}Symptom_{ij}}$	Subject /Day
CAR increase[1]:	$Cortisol_{ijk} = Intercept_{ijk} + random\ Time_{ijk} + BP\text{-}Symptom_i + WP\text{-}Symptom_{ij}$	Random part subject variance/
	$+ \underline{\beta\ Time*(BP\text{-}Symptom)_{jk}} + \underline{\beta\ Time*(WP\text{-}Symptom)_{ijk}}$	Random part day variance
DHEAS:	$logDHEAS_{ij} = Intercept_{ij} + \underline{\beta\ BP\text{-}Symptom_i} + \underline{\beta\ WP\text{-}Symptom_{ij}}$	Subject /Day
Cortisol/DHEAS ratio:	$logCDratio_{ij} = Intercept_{ij} + \underline{\beta\ BP\text{-}Symptom_i} + \underline{\beta\ WP\text{-}Symptom_{ij}}$	Subject /Day
CAR dex level:	$Cortisol_{ik} = Intercept_{ik} + Time_{ik} + \underline{\beta\ BP\text{-}Symptom_i}$	Subject
CAR dex increase[1]:	$Cortisol_{ik} = Intercept_{ik} + random\ Time_{ik} + BP\text{-}Symptom + \underline{\beta\ Time*(BP\text{-}Symptom)_{ik}}$	Random part subject variance

Research issues 2a and 2b were tested in one equation[1]. The equations were tested for two different Independent Variables (symptom): 1) Exhaustion in the morning; 2) Recovery through sleep in the morning

Note. Underscored is the explaining variable; i = subject level, j = day level, k = moment level; For the sake of clarity we did not add confounders to the formula of the appendix and left out the β's that were not reported in Tables 2a and 2b. [1] 'Random time' means that the equation allowed each individual to have his/her own regression coefficient for time (CAR slope). The explaining variable Time*Symptom is a cross-level interaction term and tries to statistically explain why individuals have different slopes. [2] Between- and within variability were tested according to the method of Schwartz and Stone (1998).

Chapter 6

Recovery from clinical burnout is possible: A prospective electronic diary study on exhaustion, depressed mood, sleep and full return to work

Submitted.

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ABSTRACT

The current study examines to what extent recovery occurs in clinically burned-out employees, and what the influence is of concurring sleep problems in return to health. Markers of recovery are symptom improvement and full return to work (FRTW). Fifty-nine burned-out employees on extended sick leave assessed their symptoms using an electronic diary for 2 weeks. After 6 months measurements were repeated. Symptom levels were compared to a healthy reference group that was assessed only once. After 6 months all burnout symptoms had reduced significantly and FRTW was achieved by 37% of burned-out individuals. The symptom levels of those who had fully returned to work were similar to healthy levels and significantly lower than levels of those still on sick leave. Individuals who benefited poorly from sleep at baseline had higher exhaustion levels at follow-up than those who did benefit from sleep. Trouble falling asleep and less refreshing sleep hampered full work resumption. The current results show that a significant part of clinically burned-out employees are able to recover in a 6 month period and that sleep plays an important role in recovery.

INTRODUCTION

Occupational physicians are often faced with employees on sick leave due to work-related problems like burnout. Burnout is a serious syndrome that is characterized by severe exhaustion, a cynical attitude towards work and low professional efficacy (1). Research suggests that the syndrome is resistant to spontaneous recovery and studies are being undertaken to explain the persistence of burnout (2). In sub-clinical burned-out samples burnout levels have shown to be stable over time periods up to 8 years (3, 4). Does this imply that employees who end up on sick leave due to burnout symptoms should not expect recovery? Studies on the stability of the burnout syndrome in clinical samples are still scarce, as are studies on the responsiveness of burnout to treatment (5). Therefore, the aim of the current study is to examine whether and to what extent recovery from clinical burnout occurs. An electronic diary is employed to assess burnout symptom severity reliably in daily life and compare symptom improvement to levels of healthy individuals. Return to work is examined as a hard end-point second indicator of burnout recovery. We will examine whether symptom improvement and return to work cohere and to what extent both indices of burnout recovery are hindered by sleep problems.

Recovery from clinical burnout: Symptom recovery

According to the Dutch practice guidelines for occupational physicians, the diagnosis "work-related adjustment disorder" covers the whole continuum of mild to severe burnout complaints (6). At present, only one study compared a no-treatment condition to two intervention conditions in self-employed individuals on sick leave due to work-related adjustment disorders (7). The treatment conditions consisted of cognitive behavioral therapy (CBT, n = 30) conducted by psychologists according to standardized protocol (8) and an activating intervention (AI, n = 28), based on CBT but conducted by labor experts and primarily focused on graded activity and workplace interventions. While CBT is symptom- contingent with return to work depending on the degree of symptom recovery, AI is time-contingent in stimulating return to work independently of symptom severity. CBT and AI did not promote symptom recovery and rendered results similar to the no-treatment condition (n = 28). Without treatment exhaustion levels remained above the clinical cutoff-score for burnout as assessed with the Maslach Burnout Inventory (MBI [9], i.e. > 2.20 [10]) for 10 months, although exhaustion decreased significantly within the first 4 months after sick leave and further improved in the following 6 months. Consistent with this, clinically burned-out individuals (n = 51) who received CBT according to the same protocol (8) recovered from exhaustion (MBI) in 8.5 months of treatment (11). Exhaustion levels remained elevated compared to healthy norm groups, however,

and stabilized in the next 6 months after CBT without further decrease (11). The CBT group was not compared to a no-treatment control group. Both studies showed comparable results for co-occurring depressed mood, anxiety and sleep problems (7, 11). Summarizing, limited but consistent evidence suggests that exhaustion decreases within approximately 10 months after sick leave but stabilizes thereafter at a level that remains elevated. At present, neither cognitive behavioral therapy nor time-contingent activating intervention appears to promote symptom recovery.

Recovery from burnout: Return to work

In addition to symptom recovery, return to work is a second important criterion for burnout recovery, which concerns both employee and employer. The aforementioned studies are again consistent in that 50% of the participants had fully returned to work without treatment or after receiving CBT, either 11 months after sick leave (7) or 8.5 months after CBT onset, which is exclusive of the time between onset of sick leave and that of CBT (11). However, AI significantly advanced 50% full return to work (FRTW) despite the lack of symptom recovery within only 4 months after sick leave. Thus AI induced this result 7 months sooner than either CBT or no treatment (7). The superiority of AI in promoting FRTW was confirmed in another study that yielded 78% FRTW in work-related adjustment disorder after 3 months, compared to 63% through 'care as usual' provided by occupational physicians (12). In sum, full return to work emerged as a slow process in clinical burnout, which can be speeded up by time-contingent activation, but seems insensitive to best available CBT.

Are symptom recovery and return to work independent processes?

Ideally full recovery from clinical burnout consists of symptom improvement to pre-morbid levels and FRTW. However, the evidence summarized above suggests that recovery in health status and FRTW follow different time paths and may in part be independent, because AI enhanced FRTW without affecting symptom recovery either positively or negatively (7, 12). This seems to indicate that work resumption does not complicate symptom recovery on the one hand, but on the other hand it does not enhance symptom recovery either. In the current study we will examine the interdependency of the processes of work resumption and symptom recovery by studying their coincidence in time, their reciprocal relationship and the correspondence of predictors.

The role of sleep

In addition, we will specifically examine the influence of sleep problems on burnout recovery. Sleep problems are reported both in the early (13-17) and the end stages of the burnout process (18-20), as assessed subjectively (19) and objectively (16, 20). Trouble falling asleep and non-refreshing sleep is reported in particular (15, 16, 19), while polysomnography in addition detected higher levels of arousal, more sleep fragmentation, and less slow wave sleep in clinical burnout (20). Same and next day data from the present project demonstrated that clinically burned-out individuals recover poorly through sleep; while accounting for severity differences in evening fatigue, the actual difference between evening and next morning levels of fatigue was reduced significantly compared to healthy individuals (19). In addition, sleep problems during the night impeded next morning recovery through sleep, while individual differences in sleep quality and recovery through sleep were unrelated (19). It is of importance that sleep problems and poor recovery appear to affect burned-out individuals independently of depressed mood (16, 19), and regardless of a co-morbid major depression (19, 20). This suggests that sleep problems are an independent concurring symptom in burnout, despite the strong relationship between burnout and depression (21).

Interestingly, sleep problems are related to long-term sick leave and work-disability. In two large-scale epidemiological studies sleep problems predicted work disability, even after adjustment for psychiatric and physical morbidity and health related behaviors (22, 23). To the best of our knowledge, the current study is the first to test the influence of sleep problems and poor recuperation through sleep on burnout recovery using longitudinal data. We hypothesize that when energy is not replenished on a daily basis, this might impede recovery from chronic exhaustion. Moreover, we expect to find that sleep problems interfere with return to work.

Electronic diary method

We employed electronic diary monitoring according to the standards of the Experience Sampling Method (ESM) (24). An electronic diary has three major advantages over common questionnaires (25). First, it obtains direct moment-to-moment assessments of symptom severity, assuring accuracy and validity by circumventing retrospection bias, i.e. the distortion caused by cognitive processes like recollecting and integrating past experiences by which retrospective questionnaires are affected. Second, it allows for assessments in the context of everyday life, which ensures ecological validity and it can, third, reveal within-person processes in fluctuating variables. An additional advantage for the present study is that the electronic diary supplements measurement with the MBI, which despite recurrent criticisms (17) is usually applied in burnout studies. The MBI items assess

symptoms related to work (for example: 'I feel used up at the end of the workday') and are therefore difficult to answer when on extended sickness absence (see for example [11]). The present study thus contributes to current knowledge of clinical burnout by assessing symptom recovery reliably and longitudinally with an innovative diary method.

Hypotheses

The current study examines 6-month recovery from clinical burnout in a sample that receives 'psychological treatment as usual'. We test the following hypotheses:

1. Within 6 months burnout symptoms will be reduced in clinically burned-out individuals to a still elevated level compared to a healthy reference group.
2. The greater part of the clinical burnout sample will not have fully resumed work after 6 months of psychological treatment, when treatment is not directed towards activation.
3. Symptom recovery and work resumption are independent processes, as indicated by the following:
   a. Clinically burned-out individuals who have fully resumed work after 6 months experience similar symptom recovery compared to those who have not fully resumed work;
   b. The level of exhaustion at baseline does not predict full return to work at follow-up;
   c. Partial return to work at baseline does not predict exhaustion recovery at follow-up;
   d. Symptom recovery and full return to work do not share common predictors.
4. a. Poor recovery through sleep will impede recovery from exhaustion
   b. and sleep problems at baseline will impede return to work in clinical burnout.

METHOD

Participants and procedure

Burned-out employees were recruited from new enrollments of Dutch centers of expertise in burnout treatment and through the Internet. Internet recruitment was carried out by linking five national web sites on burnout and stress to the research information on the university Intranet. Participant flow is depicted in Figure 1.

The following inclusion criteria were applied: (1) severe burnout complaints according to validated cut-off points from the Dutch Maslach Burnout Inventory -

General Survey (MBI-GS; exhaustion ≥ 2.20, and either cynicism ≥ 2.00 or personal accomplishment ≤ 3.67) (10) and the Checklist Individual Strength (CIS ≥ 76) (26), (2) extended absence and enrollment in professional treatment due to burnout symptoms, and (3) fulfilling the criteria for work-related ICD-10 neurasthenia (27), the proposed psychiatric equivalent of clinical burnout (5). Participants were excluded when (1) suffering from primary psychiatric disorders (while allowing *secondary* psychiatric disorders) as assessed by a semi-structured clinical interview (28) and the Symptom Checklist-90-R (SCL-90-R, General Severity Index < 214, i.e. above the mean score plus one standard deviation of psychiatric outpatients) (29), (2) when they used antidepressants or anxiolytics, and (3) if pregnant. Healthy controls were recruited from the community through newspaper advertisements and personal contacts, and were matched on age, gender and educational level with the burnout group. Healthy controls were excluded when they experienced burnout complaints (MBI-GS, CIS) or psychiatric complaints (SCL-90-R) and if pregnant. Participant characteristics of the clinical burnout group at baseline and the healthy reference group can be found in Table 1.

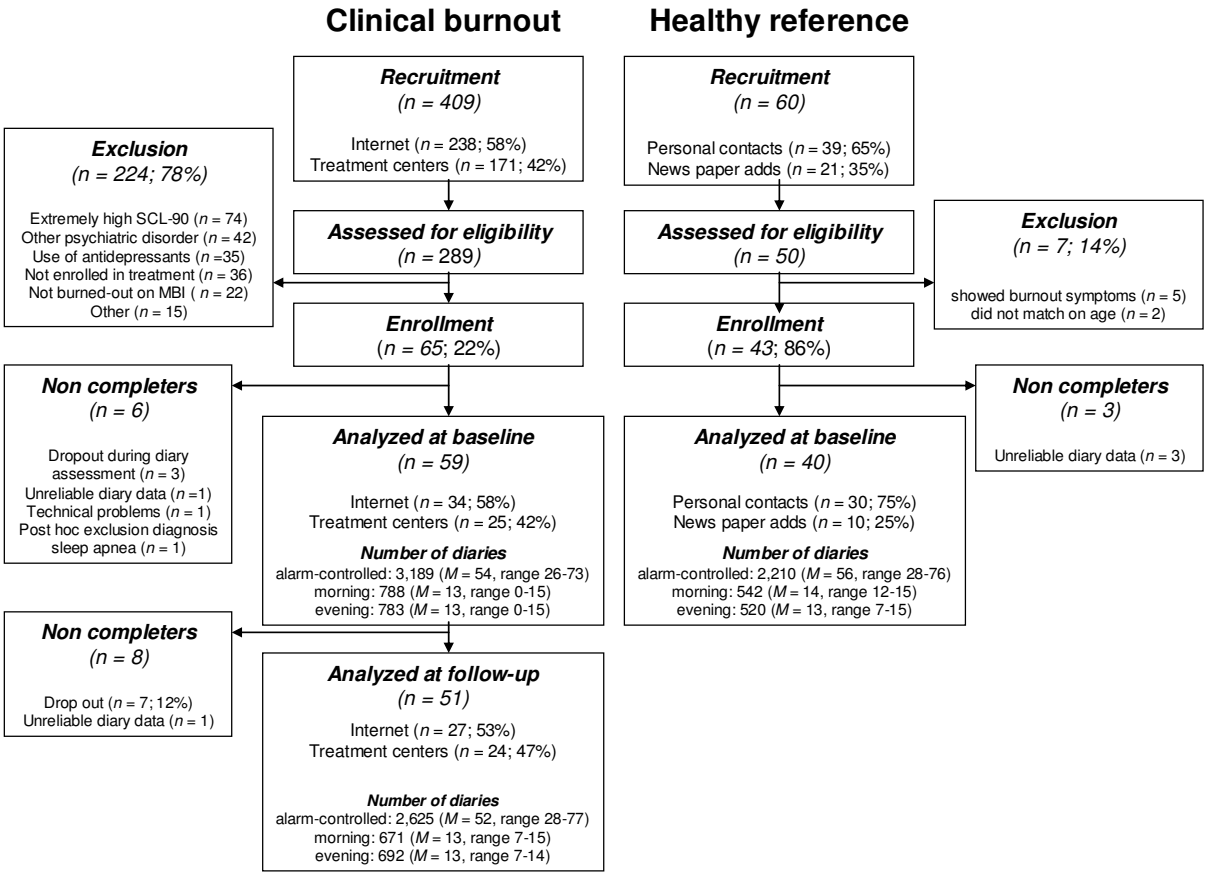

Figure 1. Participant flow

Table 1. Baseline characteristics of participants

	Group	***Clinical burnout***	***Healthy reference***	***p-value***
		n = 59	*n = 40*	
Variable		*M*(*SD*) or *n* (%)	*M*(*SD*) or *n* (%)	
In- and exclusion criteria				
Exhaustion (MBI-GS)		4.74 (0.99)	1.19 (0.54)	<.001
Cynicism (MBI-GS)		3.52 (1.35)	1.15 (0.78)	<.001
Personal Accomplishment (MBI-GS)		3.58 (1.31)	4.77 (0.71)	<.001
General fatigue (CIS)		106.1 (14.8)	41.0 (12.9)	<.001
Psychopathology (SCL-90-R)		181.0 (30.7)	104.1 (11.0)	<.001
Demographic variables				
Age (years)		42.9 (8.82)	41.8 (9.98)	*ns*
Gender ratio (% male)		26 (44.1%)	14 (35.0%)	*ns*
Married/cohabiting		45 (76.3%)	33 (82.9%)	*ns*
Education (% college/university)		34 (57.6%)	26 (65.0%)	*ns*
Hours according to contract (% full time)		32 (54.2%)	18 (45.0%)	*ns*
Complaints and sick leave				
Sickness leave	*Full*	31 (52.5%)	.	.
	Partial (partial RTW)	28 (47.5%)		
Sickness leave (weeks)		15.8 (14.3)	.	.
Complaints duration (months)	*3 – 6*	9 (15.3%)	.	.
	6 –12	18 (30.5%)		
	> 12	32 (54.2%)		
Co-morbid psychiatric disorder	*None*	38 (64.4%)	.	.
	Mood disorder	8 (13.6%)		
	Anxiety disorder	6 (10.2%)		
	Mood and anxiety disorder	3 (5.1%)		
	Mood and somatization disorder	1 (1.7%)		
	Other	3 (5.1%)		

Note. The scale range of the MBI-GS subscales is (0-6), of the CIS (20-140) and of the SCL-90-R (90-450).

Potential participants were sent an information brochure and a screening questionnaire (including the MBI-GS, CIS, and SCL-90-R). When inclusion criteria on the screening questionnaire were met, a clinical interview was conducted at home or at the research centre. The use of the electronic diary was explained during a 1-hour

instruction at home and the informed-consent form was signed. Technical backing was provided for the 2-week period of diary assessment. At 6-month follow-up (*M* = 6.3 months, *SD* = 1.0) the procedure was repeated in the clinically burned-out group, but not in the healthy reference group. After completing the study, burned-out participants were offered a remuneration of € 45 and control participants a remuneration of € 25. The study was approved by the medical ethics review committee of the Utrecht University Medical Centre.

Materials and method

At baseline participants gave information on demographics, complaints, work characteristics, sickness absence, work resumption, work adjustments, and use of sleep medication in a general questionnaire. The electronic diary was programmed into a PalmOne^{TM} handheld computer (PDA) using Pendragon software (30) and a separate program that generated randomized alarms (31). During 14 consecutive days participants kept the electronic diary every day after waking up to assess exhaustion and sleep quality (*morning diary)*, before going to bed to assess exhaustion (*evening diary)*, and on average at 5 random time points per day prompted by an alarm to assess exhaustion and depressed mood (*alarm-controlled diary)*. For the burnout group compliance to the alarm-controlled diary was high both at baseline (83%) and follow-up (79%), and comparable to compliance in the control group (80%). Compliance to the morning and evening diaries was very high in both groups and at both assessment periods (range 93-98%). The method was well accepted by the clinically burned-out participants at both time points and comparable to the healthy participants. No reactivity effects were detected, i.e. changes in ratings of symptoms over time due to the method of diary keeping itself. The electronic diary method that we used is described in more detail elsewhere (32).

Variables under study were measured with singular diary items, according to ESM premises, i.e. items are to measure states instead of constructs and mimic an internal dialogue and thus should be short and easy to comprehend (33). *Exhaustion* was measured by the statement 'Right now I feel exhausted'. *Recovery through sleep* was calculated as the difference between fatigue intensity at bedtime and at waking up the following morning. We measured fatigue with the item 'Right now I am tired' (34). The item for depressed mood was 'Right now I feel depressed', and was based on the DSM-IV criterion for depressed mood in major depressive disorder (35). We assessed four subcategories of *sleep problems* according to the three main sleep difficulties in the DSM-IV criteria of primary insomnia (35), i.e. *trouble falling asleep* ('Tonight I had trouble falling asleep'), *sleep disruptions* ('Tonight I woke up .. times'), and *refreshing sleep* ('Right now I feel refreshed'), and, in accordance with Babkoff (36), we added *sleep duration* ('Tonight I slept for .. hours'). Except for sleep

duration and sleep disruptions, answers were given on a seven point scale anchored 1 = *not at all* to 7 = *very much*.

Treatment characteristics

The clinical burnout sample consisted of 47% participants who were recruited from new enrollments of Dutch centers of expertise in burnout treatment and who received CBT by a psychologist, which is considered as 'psychological treatment as usual'. The other 53% was recruited through the Internet when they were about to start with psychological treatment. Although the groups were recruited differently, they did not differ at baseline with respect to symptom severity assessed with selection questionnaires and the diary, demographical variables and burnout related variables (complaint duration, duration of sick leave, co-morbid psychopathology, sleep medication). At follow-up 77% of the participants recruited through the Internet had actually received psychological treatment; 10% had only consulted their general practitioner, 10% had received alternative health care, and 3% had refrained from treatment. Participants recruited through the Internet were somewhat less exhausted at follow-up compared to participants recruited at treatment centers (F = 4.30, p = .04). This was the only difference found between both groups. At follow-up, 33% of all participants had finished treatment; 53% completed 1-10 sessions and 47% completed 11-20 sessions. Two-third of the burned-out participants was still involved in treatment and 24% had received 1 to 10 sessions, 51% had received 11-20 sessions, and 24% had received more than 20 sessions. The Internet group did not differ from the group recruited through treatment centers in number of sessions, or whether the treatment was finished.

Statistical analysis

We employed multilevel regression modeling in MlwiN 2.02 to detect changes in symptom severity and to compare symptom levels with healthy individuals. Multilevel regression modeling is recommended for diary data because it accounts for within-subject dependencies of data points (37). This method is comparable to multiple regression analysis in that its intercept and slope parameters are analogous to the unstandardized coefficients in a regular regression analysis. To examine the predictors of exhaustion and FRTW we used 2-week aggregates of diary variables, i.e. we calculated the mean of all available records per individual[4]. The predictors of

[4] Multilevel regression analysis was not appropriate in the predictive regression analyses for two reasons. First, the prediction of symptom recovery required a data file that included alarm-controlled records of exhaustion at baseline and follow-up were at the same line. This implies that the time-stamps of assessments at baseline and follow-up should have been identical (for example, Day 1 10:32 at baseline had to correspond with Day 1 10:32 at follow-up). Due to randomization of alarm times, identical time stamps of alarm-controlled records at baseline and follow-up were rather exceptional. Hence, this method produced a data file with too many missing values, even when the precision of time equality was lessened. Second, when the dependent variable is measured at the highest level of analysis (FRTW) the independent variables have to be at the same level.

exhaustion at follow-up were examined through stepwise multiple regression analysis and predictors of FRTW through forward stepwise LR logistic regression analysis. The latter analyses were conducted using SPSS 12.0.

RESULTS

Drop-out analysis

Drop-out analysis showed that the participants who completed the study (n = 51) were more highly educated (χ^2 = 7.72, p < .01), more often married or cohabiting (χ^2 = 4.53, p = .03), and had a longer complaint duration (t (19)= -2.48, p = .02) but a shorter sickness duration (t (55) = 2.05, p = .05) compared to the participants who dropped-out (n = 8). Symptom severity at baseline, as measured with the diary, did *not* differ between both groups ($F_{6,49}$ = 0.53, p = .53), and *no* differences were found for age, gender, selection criteria (i.e., MBI-GS, CIS, SCL-90-R), presence of a co-morbid major depression, source of recruitment, partial or full-time sick leave, or type of contract (full or partial).

Table 2. Symptom recovery in clinical burnout

Group		***Clinical burnout***			***Healthy reference***		
	Baseline	6 month	test-value	*p*-value	Baseline	test-value[1]	*p*-value
Symptoms		follow-up					
Exhaustion	3.34 (.12)	2.56 (.09)	-8.58	<.001	1.84 (.17)	4.18	<.001
Recovery through sleep	1.38 (.14)	1.53 (.09)	2.27	.02	2.13 (.27)	2.25	.02
Trouble falling asleep	2.96 (.15)	2.56 (.09)	-4.59	<.001	1.79 (.21)	3.81	<.001
Refreshing sleep	3.56 (.11)	4.10 (.07)	7.92	<.001	4.77 (.21)	-3.24	.003
Depressed mood	2.79 (.13)	1.98 (.19)	-4.26	<.001	1.41 (.17)	3.39	.002

Note. Scales range from 1 = *not at all* to 7 = *very*. Differences are calculated on disaggregated diary data with multilevel analysis. The test value is a Wald test that follows a normal distribution: Z = estimate / standard error of estimate. Burned-out individuals on partial sick leave or full sick leave at baseline, did not differ in symptom severity at baseline. [1] Burnout symptom severity at 6-month follow-up compared to healthy reference group.

Symptom recovery (Hypothesis 1)

Table 2 shows symptom recovery in clinical burnout after 6 months. As expected, burned-out individuals had significantly improved on *all* symptoms, i.e. exhaustion, sleep problems, recovery through sleep, and depressed mood, but symptom levels were still elevated compared to healthy individuals. Figure 2 shows the diurnal courses of fatigue in clinically burned-out individuals at baseline and follow-up

compared to healthy levels as predicted by multilevel regression modeling. The overall level of fatigue in the burnout group had significantly decreased at follow-up (Z = -7.07, p < .001), albeit not to healthy levels (Z = 4.71, p < .001). But, the diurnal course of fatigue in clinical burnout became stronger within 6 months time (linear slope Z = -0.39, p < .001; quadratic slope Z = 4.80, p < .001) and did *not* differ from the healthy slope at follow-up (linear slope of Z = 1.04, p = .29; quadratic slope Z = 1.74, p = .08). This indicates that at follow-up the diurnal pattern of fatigue in clinically burned-out participants resembled the U-shaped pattern of healthy individuals.

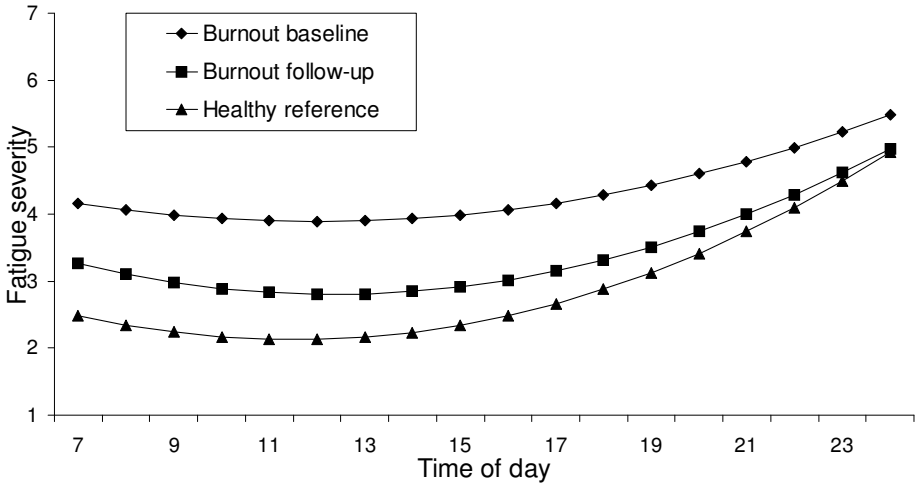

Figure 2. Recovery of diurnal cycles of fatigue in clinical burnout. Scale ranges from 1 = *not at all* to 7 = *very*.

Full return to work (FRTW; Hypothesis 2)

Table 3 presents a cross tabulation of return to work at baseline and follow-up. At 6-month follow-up, 37% of the participants (n = 19) had fully returned to work, consistent with our expectations. Six of them returned in an adapted job: 4 in a different function, 1 in a different function with reduced working hours, and 1 reduced his or her working hours without a change in function. Compared to work status at baseline 55% of burned-out participants improved, either from full sick leave to partial or full RTW, or from partial RTW to full RTW. Only 10 participants (20%)

deteriorated, mainly because they lost their jobs due to reorganizations or temporary contracts. None of the jobless participants received a disability pension at follow-up.

Table 3. Return to work at 6 month follow-up in clinical burnout

Follow-up	***FRTW***	***No FRTW***			***Total***
Baseline		No job	No RTW	Partial RTW	
No RTW	6	6	7	9	28
	(12%)	(12%)	(14%)	(18%)	(55%)
Partial RTW	13	3	1	6	23
	(26%)	(6%)	(2%)	(12%)	(45%)
Total	19	9	8	15	51
	(37%)	(18%)	(16%)	(29%)	(100%)

Note. FRTW = Full return to work; RTW = return to work

The relation of symptom recovery and FRTW (Hypothesis 3)

Figure 3 shows symptom levels at baseline and follow-up of burned-out participants who fully returned to work (FRTW) and burned-out participants who did not fully return to work (NFRTW), as well as symptom levels of a healthy reference group *(Hypothesis 3a)*. At baseline, the FRTW and NFRTW groups were equally exhausted and depressed, but reported different levels of recovery through sleep and a different amount of sleep problems. The FRTW group recovered better through sleep, experienced less trouble falling asleep, and felt more refreshed in the morning (p ranges from .01 to .001). Actually, the FRTW-group appeared to be unimpaired at baseline regarding recovery through sleep and trouble falling asleep compared to healthy participants (respectively, $Z = 0.96$, $p = .34$; $Z = 1.53$, $p = .13$*).* At follow-up, sleep problems, recovery through sleep and depressed mood in the FRTW-group were comparable to levels of healthy individuals, but exhaustion was still somewhat elevated ($Z = 2.12$, $p = .01$). In contrast, the NFRTW group still differed from healthy individuals on *all* symptoms (p ranges from .01 to .001). Therefore, Hypothesis 3a was not confirmed.

The final predictive regression models for exhaustion and full return to work at follow-up are shown in Table 4. Not surprisingly, baseline levels of the dependent variables appeared to be the strongest predictors in both analyses; exhaustion level at baseline predicted exhaustion at follow-up and partial sick leave at baseline (or better: partial return to work) predicted full return to work at follow-up. As expected (Hypothesis 3b), partial sick leave at baseline did not predict exhaustion, and exhaustion at baseline did not predict FRTW.

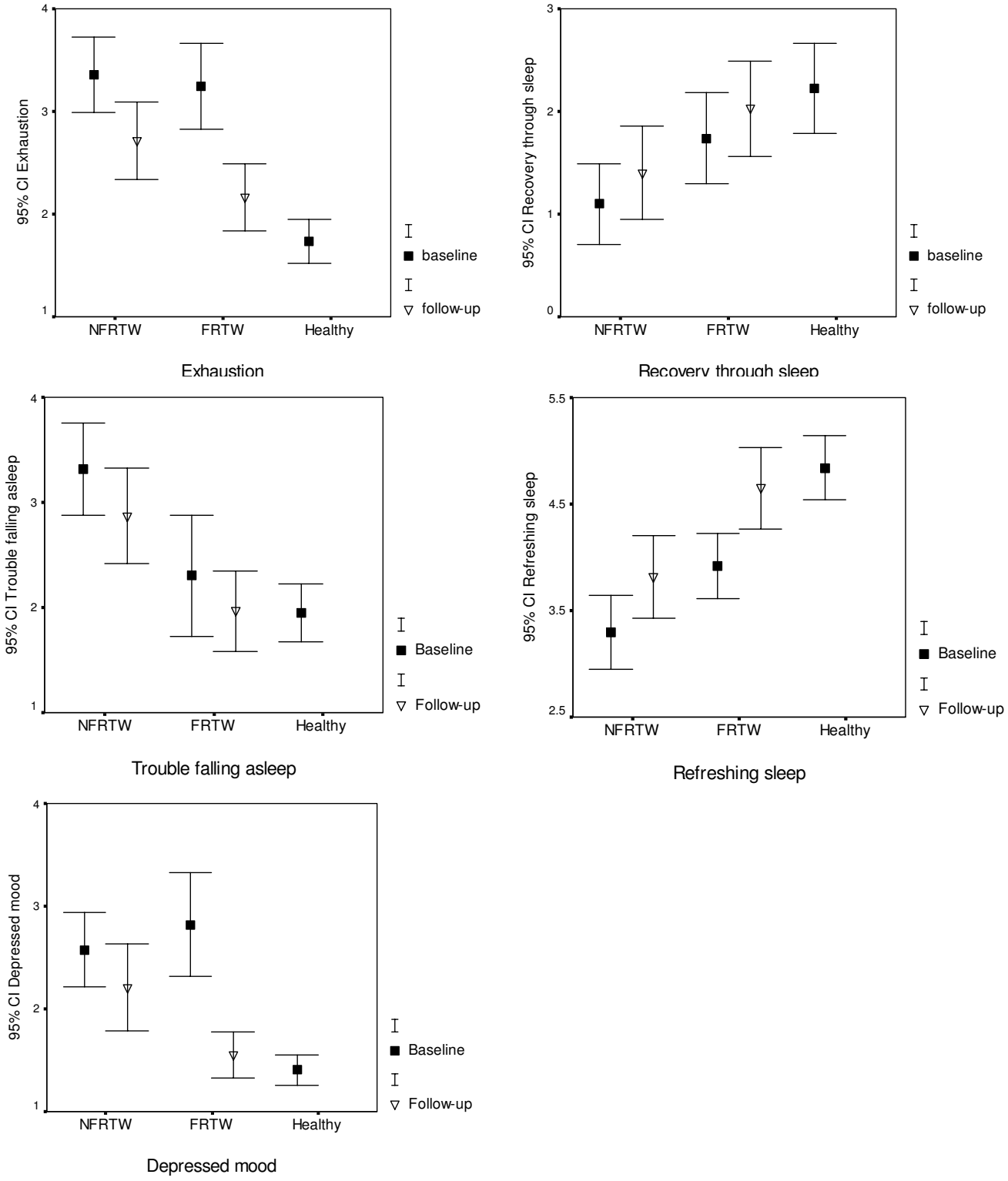

Figure 3. Co-occurrence of symptom recovery and full return to work.
FRTW = full return to work, NFRTW = no full return to work. Scales range from 1 = *not at all* to 7 = *very,* except for recovery through sleep. Recovery trough sleep is the difference between fatigue intensity before going to sleep and after awakening the following morning.

Table 4. Prediction of exhaustion (linear regression) and FRTW (binary logistic regression) at follow-up

	Prediction exhaustion			***Prediction FRTW***	
Baseline variables	Beta	B[1]	SE B[1]	Odds ratio	Score[2]
Dependent variables at baseline					
Exhaustion	.66***	0.68	0.08	.	1.31
Partial sick leave	-.02	.	.	6.50**	.
Concurring symptoms					
Depressed mood	-.08	.	.	.	0.12
Recovery through sleep	-.25**	-0.21	0.07	.	0.38
Sleep duration	.23*	0.29	0.12	.	2.76
Trouble falling asleep	.04	.	.	0.45*	.
Sleep disruptions	-.05	.	.	.	0.30
Refreshing sleep	-.10	.	.	2.82*	.
Demographic variables					
Age	.40***	0.04	0.01	.	0.08
Gender	-.02	.	.	.	0.85
Married/co-habiting	-.02	.	.	.	0.01
Education	.24**	0.46	0.15	.	1.41
Full or partial contract	.02	.	.	.	0.18
Other confounders					
Follow-up duration (months)	-.23**	-0.20	0.07	.	4.22
Recruited through the Internet	-.23**	-0.43	0.14	.	0.14
Duration of sick leave	-.01	.	.	.	0.19
Complaint duration	.08	.	.	.	1.80
Co-morbid depression	-.02	.	.	.	0.01
Explained variance		.75		.57	

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. [1] In stepwise regression analysis, the B-coefficient and its standard error are solely given for the predictors that entered the final model [2] The score indicates the importance of a variable that did not enter the final model. The higher the score, the more important the variable.

Exhaustion recovery and FRTW were predicted by different baseline variables, conform Hypothesis 3c. High exhaustion at follow-up was predicted by (in order of significance): high exhaustion, high age, poor recovery through sleep, high education level (university or college degree), a shorter follow-up duration, recruited through treatment centers (compared to Internet), and a longer sleep duration. FRTW was predicted by partial sick leave at baseline, less trouble falling asleep and more refreshing sleep at baseline.

Poor recovery through sleep and sleep problems (Hypothesis 4)

As noted above, sleep variables significantly predicted both markers of burnout recovery. Poor recovery through sleep at baseline predicted high levels of exhaustion at follow-up, conform Hypothesis 4a. Remarkably, a longer sleep duration at baseline was additionally predictive of higher exhaustion levels at follow-up. FRTW was predicted by less trouble falling asleep and more refreshing sleep conform Hypothesis 4b. Daily recovery and refreshing sleep were strongly correlated at baseline ($r = .63$, $p < .001$), but poor recovery through sleep did not emerge as a significant predictor for FRTW when refreshing sleep was excluded from the regression model.

To account for the influence of a co-morbid major depression we repeated all analysis excluding burned-out participants with a co-morbid depression ($n = 10$). The results did not change with respect to the first three hypotheses, but did change for Hypothesis 4, i.e. the influence of sleep problems and poor recuperation through sleep on 6-month recovery from burnout. Namely, exhaustion severity at follow-up was no longer predicted significantly by poor recovery through sleep and sleep duration, though a trend remained ($\beta = -.13$, $p = .13$ and $\beta = .16$, $p = .09$, respectively). The FRTW group was still characterized by unaffected sleep at baseline, as discussed above. However, sleep problems did no longer predict FRTW in the binary logistic regression model. Instead, FRTW was predicted by being male (odds ratio = 41.46, $p < .01$) and by a shorter duration of complaints (odds ratio = 0.93, $p < .05$), in addition to the influence of partial sick leave at baseline, which remained a significant predictor (odds ratio = 38.22, $p < .05$).

DISCUSSION

The main aim of the current study was to examine the possibility of recovery from clinical burnout within 6 months of ‘psychological treatment as usual’. We observed both symptom recovery and return to work, as well as their co-occurrence. In addition, we studied the influence of various aspects of sleep on burnout recovery.

Symptom recovery (Hypothesis 1)

In line with our expectations, exhaustion, depressed mood, poor recovery through sleep and sleep problems had decreased significantly within 6 months, though remained elevated in comparison to a healthy reference group. As far as we know, this study is the first to examine symptom recovery through thorough and reliable assessments of symptoms at the moment of occurrence. Nevertheless, the results were in accordance with previous research using retrospective questionnaires (7, 11, 12). Based on our electronic diaries we may now add that the diurnal curve of fatigue returned to a healthy U-shaped pattern after 6 months, albeit that fatigue severity remained somewhat elevated. The difference between the healthy reference group and the burnout group might be estimated rather conservatively, since the absence of burnout complaints was used as a selection criterion for the healthy group. Given that 10% of the Dutch working population suffers from exhaustion (CBS, www.statline.nl), our healthy reference group was probably healthier than a random sample taken from the population. The current results show that significant recovery of symptoms is possible in clinical burnout within 6 months time.

Full return to work (Hypothesis 2)

Since 'psychological treatment as usual' does not involve activation, we expected that full work resumption would be limited in clinical burnout within 6 months. Again in line with our expectations, 37% of the clinically burned-out participants had fully resumed work 6 months after treatment onset (which equals on average 10 months of sick leave). These results are comparable to the 39% of clinically burned-out individuals who received CBT and fully returned to work within 8.5 months after treatment onset (11), and to the 50% of employees with work-related adjustment disorders who received CBT or no treatment at all and fully returned to work within 11 months after the onset of sick leave (7). Our results are in contrast with the 64% FRTW within 3 months in employees with work-related adjustment disorders, who received care as usual by an occupational physician (12). This considerable difference is probably not due to the different clinical diagnoses of the study of Van der Klink et al. compared to ours (i.e. 'work-related adjustment disorders' vs 'work-related neurasthenia') or to the immediate start of the intervention after sick leave in the study of Van der Klink et al. compared to the onset of treatment at 4 months after sick leave in the current study. The study of Blonk and colleagues was comparable on these aspects to the study of Van der Klink and colleagues, but rendered different results that were comparable to ours (7). The difference might be explained by the caregiver, since in the study of Van der Klink and colleagues care was provided by an occupational physician instead of a psychologist. It is likely that the focus of an occupational physician is stronger directed towards work resumption, instead of

symptom recovery. We may conclude that full return to work is a slow process in clinically burned-out employees who receive psychological treatment: in more than half of the cases full work resumption takes more than 10 months.

The relation of symptom recovery and FRTW (Hypothesis 3)

Based on the literature, we formulated the hypothesis that symptom recovery and work resumption are independent recovery processes. Indeed, exhaustion at baseline did *not* predict FRTW at follow-up and partial sick leave at baseline did *not* predict recovery from exhaustion (Hypothesis 3b). Moreover, there were *no* corresponding predictors in both recovery processes (Hypothesis 3c). But in contrast with these findings, full return to work was related to significantly more symptom recovery than partial or no work resumption (Hypothesis 3a). Since the FRTW group already experienced significantly less sleep problems at baseline, symptom recovery and FRTW co-occurred only for exhaustion and depressed mood. These results seem to be in contrast with the randomized controlled trials in employees with work-related adjustment disorders (7, 12). Employees who received an activating intervention returned to work up to 7 months earlier, but symptom recovery was not enhanced compared to the individuals who received CBT or no treatment. The apparently contrasting results might actually illustrate the symptom-contingent approach of the psychologists in the current study, i.e. they might have advised to resume work when symptoms have decreased, in contrast with the time-contingent approach of activating interventions. In conclusion, symptom recovery and work resumption appear to be independent processes, though may co-occur in 'psychological treatment as usual'.

Poor recovery through sleep and sleep problems (Hypothesis 4)

We suggested that when energy is not replenished on a daily basis through sleep, recovery from exhaustion (burnout's core symptom) may be hampered in the long run (Hypothesis 4a). This hypothesis was confirmed, as was our hypothesis that sleep problems at baseline reduced the likelihood of full work resumption within 6 months (Hypothesis 4b). Sleep particularly influenced recovery from burnout in individuals who additionally suffered from major depression. The influence of recovery through sleep at baseline on exhaustion severity at follow-up was weakened and the influence of sleep variables on FRTW disappeared when taking depression into account. In contrast with our findings, prior studies found that sleep problems impeded return to work in the general population, even after adjustment for psychiatric morbidity (22, 23). This discrepancy may be due to our small sample size. Excluding participants with a co-morbid depressive disorder reduced statistical power, and a weak effect for the influence of poor recovery through sleep on

exhaustion remained. For the time being, we conclude that poor recovery through sleep and sleep problems play a complicating role in recovery from clinical burnout. However, confirmation whether this only applies to burned-out individuals with a co-morbid depression in a larger sample still stands out.

Limitations

The current study has several limitations. First, we did not execute a randomized controlled trial and the treatment received was rather heterogeneous. Consequently we do not know whether recovery was due to treatment or occurred spontaneously. Since highly structured CBT did not influence symptom recovery in a prior study on employees with work-related adjustment disorders, we may have observed spontaneous recovery (7). Second, we recruited participants in two different ways, i.e. via treatment centers and trough the Internet. Although all participants intended to enroll treatment, 25% of the Internet group had *not* received psychological treatment at follow-up. Participants in the treatment centers received CBT, but psychological treatment in the Internet group might have been more heterogeneous. However, we observed almost no differences between both groups, and the only difference found was in favor of the Internet group (less exhaustion at follow-up). Third, we used the most common burnout questionnaire, the MBI, to include clinically burned-out individuals, despite the problems with the MBI in a population on sick leave, mentioned earlier. However, although the MBI was used to include burned-out individuals, the decisive inclusion criterion was meeting the diagnosis of work-related neurasthenia (27), which has been proposed as the psychiatric equivalent of burnout (5). Fourth, our results do *not* allow for conclusions on symptom recovery or relapse beyond 6 months. A comparable study on clinical burnout observed stabilization of symptom levels after treatment (on average after 8.5 months) (11). Since treatment had not ended in most of our participants, symptom levels might have further decreased beyond 6 months. Fifth, the possibility of generalizing our findings to the clinical burnout population may be hampered by the large proportion of highly educated individuals in our sample, and the drop-out of lower educated participants at follow-up. Since a high educational level was related to poorer recovery from exhaustion, it can be speculated that results may be more positive for clinically burned-out individuals with a lower educational level. Finally, we included participants with co-morbid psychiatric disorders when the onset of burnout symptoms preceded the onset of a co-morbid psychiatric disorder. On the whole, the inclusion of these cases in fact increased the generalizability of our results since co-morbid psychiatric disorders are common among severely burned-out patients (38). A co-morbid depression (the most common co-morbid psychopathology) did not

confound most of our results, except for the influence of sleep in burnout recovery. We elaborated on this finding above.

Implications

Our most important finding is that recovery from clinical burnout can be expected, even up to approximately healthy levels for a large group of burned-out participants. This should be incorporated in patient education at the beginning of treatment, since the expectancy of recovery is important for recovery itself (39). Moreover, the current results indicate that assessing and treating sleep problems in clinical burnout deserves more attention, in particular in burned-out individuals who suffer from a co-morbid major depression. The presence of a co-morbid depression itself does not seem to impede recovery from burnout. Older employees and employees with a college or university degree are at risk for poorer recovery from exhaustion. Partial work resumption at baseline was an important indicator for full work resumption at follow-up, which corresponds with the observed effect of activating interventions (7, 12). Therefore, work resumption in clinical burnout might be enhanced by a time-contingent approach.

Further study is needed to examine the effectiveness of psychological treatment (CBT) in clinical burnout in comparison to spontaneous recovery, and to examine the success of an activating intervention. Knowledge on the pre-morbid levels of symptoms in burned-out individuals would improve our understanding of the current results as either full or partial recovery. High stability of exhaustion scores in mildly burned-out individuals may suggest that clinically burned-out individuals have always functioned at 'unhealthy' levels as far as exhaustion is concerned (4), but this remains to be explored.

Final remark

The bad news is that at present recovery from symptoms and return to work in clinical burnout are slow. The good news is that recovery from clinical burnout is possible within 10 months after the onset of sick leave, and that much is to be gained in improving burnout treatment.

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Chapter 7

General discussion

The aim of this thesis is to obtain a better understanding of *clinical* burnout, the severest state of burnout that causes extended sick leave. Thus far this psychological state has received relatively little scientific attention. The emergence of burnout is work-related, which may explain the concentration of scientific research on working employees with mild symptoms. Clinical burnout has a largest impact on personal and societal costs however, pertaining to impaired quality of life and economic loss. This is amplified by the fact that once this state is reached, it is resistant to change (Blonk, Brenninkmeijer, Lagerveld, & Houtman, 2006; Mommersteeg, Heijnen, Keijsers, Verbraak, & Van Doornen, 2006). It is therefore an urging issue to clarify the condition of clinical burnout, which is the aim of this dissertation.

Since burnout is work-related, but the conditions of work sink to the background when on extended sick leave, the first thing to be clarified is the *actual* occurrence of burnout symptoms and their associations when the individual is sick with it at home. One has been diagnostically assessed to some extent – results of which may be vague, however – and most are under some sort of treatment at that point. These 'diagnostics', the treatments and especially the distance from the work environment could influence the state of the sufferer and his/her presentation of symptoms. but fact is that scientific knowledge on this issue is missing. This knowledge is important because it also pertains to clinical practice, in the sense that it may contribute to the evidence basis of assessment and have implications also for treatment of this severe condition.

This dissertation compiles our studies on the actual functioning – in daily life – of individuals with *clinical* burnout. The focus is threefold. We studied the severity, stability, and mutual relationships of exhaustion and sleep disturbances, controlled for the confounding influence of depression (*Chapters 3 and 4)*; conducted an in-depth examination of the proposed psychophysiological deregulation (*Chapter 5)*; and investigated recovery within a time-span of 6 months (*Chapter 6)*. For these purposes we employed an *innovative method,* the electronic diary, the use of which was tested for the present population (*Chapter 2)*. The electronic diary was utilized according to the Experience Sampling Method (ESM) (Csikszentmihalyi & Larson, 1987), comparable to Ecological Momentary Assessment (EMA) (Stone & Shiffman, 1994), and offers the unique opportunity to adopt a within-person perspective, next to providing a more reliable account of individual differences (between-person perspective). We sampled symptoms intensively during 2 consecutive weeks and, in addition, used a longitudinal diary design by repeating this sampling after 6 months. We underscore that such extensive symptom assessments is a new approach in this field of research (Sonnentag, 2005).

The primary objective of this chapter is to summarize and integrate the results of the present studies and to discuss possible explanations for these findings, with the purpose to add understanding to the phenomenon of clinical burnout and help clarify the picture of this impairing condition. We will in addition discuss the added value of the electronic diary and attend to limitations of the present studies. Last, we will address the implications of our findings for clinical practice and will suggest directions for future research.

SUMMARY AND INTEGRATED VIEW OF THE MAIN FINDINGS

We extensively studied individuals on extended sick leave due to symptoms of severe burnout and had enrolled in some sort of psychological treatment for the condition. Participants were asked to assess their symptoms with an electronic diary several times a day for 2 weeks. A healthy reference group followed the same procedure and results from both groups were compared. The results clarify the condition of clinical burnout regarding the following aspects.

Regarding the core symptom, exhaustion, we first examined whether the variability and diurnal patterns of (severe) fatigue, to see whether changes occur that reflect the end-stage of a process of energy erosion. The results showed that clinical burnout is marked by severe and continuous fatigue every day (*Chapter 2*) and during the whole day, displaying little variability and a flattened diurnal course compared to normal (*Chapter 3*). Severe 'exhaustion' distinguishes burned-out individuals from healthy individuals, because the latter do not label their feelings of tiredness as 'exhaustion' but as 'fatigue', with the exception of the tiredness felt in the late evening (*Chapter 3*).

Consequently, we explored whether fatigue failed to respond to sleep in the clinical burnout sample and whether common sleep disturbances could account for this (C*hapter 4).* The results showed that burned-out individuals were indeed no longer able to properly recover from fatigue during the night, and thus woke up fatigued and drained. Sleep duration and sleep maintenance seemed unaffected, though. Poor sleep quality was reported as feeling drained after awakening and as trouble falling asleep. Sleep disturbances were prospectively related to poor recovery. This suggests that sleep disturbances hinder the normal process of recovery from fatigue.

Burned-out individuals also suffered from depressive symptoms, such as depressed mood, loss of appetite, loss of enjoyment of activities and life satisfaction, with depressed mood as the most prominent symptom (*Chapter 4)*. Although sleep disturbances and depression are closely linked, poor recovery through sleep

appeared to be a marker for the burnout syndrome, rather than a sign of depression (*Chapter 4*). Co-morbidity with major depressive disorder was found in 12 participants. Nevertheless, these participants experienced similar symptom severity (*Chapter 3 and 4*).

In *Chapter 5* we used the electronic diary method to examine existing obscurities about possible psychophysiological influences in burnout. The Hypothalamic Pituitary Adrenal axis (HPA-axis) is thought to be involved in an individual's long-term adaptation to stress, as is the case in burnout. HPA-axis functioning can be measured in the cortisol awakening response (CAR), DHEAS, the cortisol/DHEAS ratio, as well as in feedback sensitivity as measured by the dexamethasone suppression test (DST). Previous studies failed to observe any relationships between symptom severity and the physiological measures cortisol and DHEAS using retrospective questionnaires. We, therefore, used the electronic diary method to provide a more reliable estimation of symptom severity and to examine between- and within-individual relationships. Saliva cortisol samples were collected on 3 consecutive workdays within the 2 week period for most of the participants. The severity of exhaustion was weakly related to HPA-axis functioning. Burned-out individuals characterized by the highest exhaustion levels (either over the entire day or right after awakening) showed a slight hypo-functioning of the HPA-axis in comparison to less exhausted burned-out individuals. (Note that participants were all on extended sick leave.) Also, all burned-out individuals seemed to experience a slight hypo-functioning of the HPA-axis on days when they woke up more exhausted and/or more poorly recovered compared to more energetic awakenings. These findings remained even when accounting for the influence of depressed mood, and when excluding those individuals with co-morbidities.

In *Chapter 6* we examined whether recovery from clinical burnout is possible. We wanted to know whether symptom stability as found in mild burnout also holds for employees who call in sick and ask for professional help. At follow-up, 6 months after treatment onset, the 2-week diary assessments were repeated in the clinical burnout group. After 6 months of psychological treatment all burnout symptoms (exhaustion, recovery through sleep, sleep disturbances and depression) had reduced significantly and the healthy dynamics of fatigue had been restored. A significant part of the clinical burnout group (37%) even experienced a full recovery; they went back to work and no longer experienced burnout symptoms. Since we previously found that sleep disturbances hindered restoration of energy on a daily basis, we were particularly interested in the influence of sleep disturbances on 6-month recovery. Individuals that fully recovered were characterized by the absence of sleep disturbances at baseline. Poor recuperation through sleep at baseline predicted higher exhaustion levels after 6 months, whereas trouble falling asleep and

non-refreshing sleep hampered full work resumption. Yet the effects of trouble falling asleep and non-refreshing sleep decreased and disappeared respectively, when excluding the individuals with co-morbid depression. Due to a lack of statistical power we were unable to reliably establish whether sleep disturbances specifically hinder recovery in depressed burned-out individuals. Co-occurring depression was not a risk factor for decreased symptom recovery or prolonged work resumption after 6 months *(Chapter 6).*

Summarizing, clinical burnout is characterized by continuous severe fatigue that is not relieved by sleep and is, at least partially, maintained by sleep disturbances. Though depressive mood is common in clinical burnout, depression does *not* seem to complicate the syndrome. The severity of exhaustion is reflected in somewhat lower cortisol levels at awakening. Nevertheless, recovery from clinical burnout is possible in the long-run. These findings are, likely, highly reliable, considering that we used ESM for symptom assessment, and the method was well accepted and adhered to, and did not seem to influence the ratings itself (*Chapter 2).*

HOW TO UNDERSTAND THE SYMPTOMS OF CLINICAL BURNOUT?

Burnout as the end state of a process of energy erosion

We observed a continuous state of exhaustion in clinical burnout, and poor responsiveness to sleep. These symptoms may reflect an end state of a long process of energy erosion (Hobfoll, 2001; Shirom, Melamed, Toker, Berliner, & Shapira, 2005). In the early years of burnout research, terms as *'a progressive loss of energy'* (Edelwich & Brodsky, 1980) or *'psychological erosion'* were used to describe the syndrome (Etzion, 1987). Later on, the conservation of resources (COR) theory rendered an explanation for the assumed erosion process. COR theory states that burnout occurs when resources (time, energy) are invested into work whilst no resources are gained, resulting in, for instance, missed opportunities at both work and important recovery activities, such as family time (Hobfoll, 2001). Moreover, COR theory holds that the initial loss of resources brings forth further losses, thus setting off a spiral of losses. This spiral of losses seems to result in an 'empty energy tank', i.e. clinical burnout. A recent approach also advocates the role of recovery debt (or chronic load) in the development of burnout (Geurts & Sonnentag, 2006). In an extensive review Geurts and Sonnentag (2006) propose that daily recovery is a vital factor linking acute load reactions and chronic health care impairment. When daily psychophysiological unwinding is hindered consistently individuals run the risk of chronic health impairment. Psychophysiological unwinding can be attained by recovery time during work (mini breaks) or after work (no

overtime and no rumination about work). Active engagement in activities of leisure (sports, social activities) seems particularly effective for unwinding (Sonnentag, 2001). Burned-out individuals indeed report neglecting this psychophysiological pattern of unwinding (Ekstedt & Fagerberg, 2005). The empty energy tank or extensive recovery debt was reflected in this thesis in the severe ratings and flattened diurnal course of fatigue.

The persisting exhaustion, even in absence of the original work stressor, further reflects how difficult it is to 'refill the tank again'. Kant et al. (2004) calculated on the basis of prevalence- and incidence-rates, that recovery from burnout takes on average 2.5 years. Consistently, even patients who displayed the highest levels of recovery showed slightly elevated exhaustion levels after 6 months. We did observe, however, a restoration in the dynamics of fatigue after 6 months, i.e. the reappearance of the U-shaped trend of fatigue. This may be interpreted as an early sign of burnout recovery. The slow recovery from exhaustion was found in two other longitudinal studies on clinical burnout. The first study showed that although exhaustion did spontaneously decrease within the first 4 months after sick leave, and further improved in the following 6 months, exhaustion levels remained elevated (Blonk et al., 2006). The second study showed a decrease of exhaustion after 8.5 months of cognitive behavioral therapy, and a stabilization at still elevated exhaustion levels in the following 6 months (Mommersteeg, Heijnen, Verbraak, & van Doornen, 2006b). Our replication of the fact that severity of exhaustion at baseline predicts exhaustion at follow-up (Schaufeli & Enzmann, 1998) may indicate that individuals with higher levels of energy erosion need more time to recover.

In conclusion, clinical burnout may be defined as the persistent end state of a process of energy erosion.

Sleep disturbances as a maintaining factor for burnout

Since clinical burnout is characterized by continuous exhaustion, it seems logical and important to focus on sleep, the primary source of recovery from fatigue by healthy individuals. We observed subjective sleep disturbances in clinical burnout, which have also been observed in earlier studies (Ekstedt et al., 2006; Mommersteeg, Heijnen, Keijsers et al., 2006; Mommersteeg, Heijnen et al., 2006b). These subjective sleep disturbances seem to reflect an objective disturbed sleep. An innovative study by Ekstedt et al. compared one night of polysomnographical recordings (PSR) and a 10-day sleep diary of 12 clinically burned-out patients with 12 healthy individuals (Ekstedt et al., 2006). Both PSR and diary assessments revealed equal sleep durations in burned-out and healthy individuals. These results are in line with the 2-week diary assessments of 60 clinically burned-out individuals in this thesis. Ekstedt et al. also showed that burned-out individuals need 10 more

min to fall asleep than healthy individuals (PSR, sleep onset latency; $p = 0.13$), which is also in line with our electronic diary assessments. As measured by the PSR, clinically burned-out individuals did *not* wake-up more often during the night; this is, again, in line with this thesis. Furthermore, burned-out participants displayed less 'deep' sleep, reflected in significantly more arousals per hour, more stage 1 sleep and less slow wave and REM sleep (shown by PSR). The latter findings are hard to assess with a diary but may have been reflected in the reported non-refreshed awakenings. In sum, objective sleep indices in a small sample of patients support the proposition that sleep is disturbed in clinical burnout. In particular, they experience trouble falling asleep and less deep sleep.

Having established that sleep disturbances are prominent in clinical burnout it seems likely that disturbed sleep plays a role in maintenance of energy erosion. Disturbed sleep impedes recovery from daily stress, and leads to the accumulation, as well as the persistence, of strain (Akerstedt, 2006). Consequently, enduring sleep disturbances may also play a role in the development of burnout. This was, however not studied in the current thesis. We did observe that sleep disturbances directly influence the extent of recovery through sleep in clinical burnout. And, poorer recovery through sleep at the onset of treatment predicted the persistency of exhaustion 6 months later, while the amount of sleep disturbance predicted the persistency of sick leave. This suggests that clinically burned-out individuals who do not experience replenishment of energy through sleep on a daily basis are indeed at risk of continuing exhaustion and leave from work.

There is empirical support in healthy adults that even a relatively moderate lack of sleep - 6 instead of 8 hours of sleep - during 1 or 2 weeks can seriously impair day-time functioning (Van Dongen, Maislin, Mullington, & Dinges, 2003). Consequently, burnout may be the result of a cumulative sleep debt. We saw that burned-out individuals sleep as long as healthy individuals do, but burned-out individuals report a stronger *need* for sleep than healthy individuals (Ekstedt et al., 2006). In the study of Ekstedt et al. burned-out individuals indicated that the amount of sleep they acquired was only 77% of the amount of sleep they needed, while healthy individuals – who slept just as long – were quite content with the same amount of sleep (93%) (Ekstedt et al., 2006). Given their state of exhaustion it seems obvious that burnout patients report a higher need for sleep, based on the sensible idea that it is a useful tool in relieving fatigue. The problem however is not to the hours of sleep but sleep efficiency.

The physiological mechanism underlying poor sleep is not yet well understood. The hyper arousal theory of sleep disturbances seems the most plausible proposal to-date (Ekstedt et al., 2006; Melamed, Shirom, Toker, Berliner, & Shapira, 2006; Pigeon & Perlis, 2006): Sleep disturbances occur when the body is in

a continuous state of psychophysiological arousal or is unable to regulate relaxation at night. Strain, the inability to unwind, and worry about work in the evening causes or intensifies the physiological hyper-arousal (Akerstedt, 2006; Morgan, 2006; Pigeon & Perlis, 2006). However, the reviewed studies all mention that evidence for the hyper-arousal theory is still limited and needs further exploration, particularly in longitudinal designs.

In sum, poor sleep quality is a concurring symptom in clinical burnout that seems to contribute to its maintenance. The proposed physiological mechanism underlying this maintenance, as covered by the hyper-arousal theory, remains to be confirmed. Furthermore, it has yet to be established whether poor sleep quality has contributed to the development of burnout.

Physiological deregulation as a possible correlate of burnout

Chronic stress (at work) is thought to lead to physiological deregulations. Therefore reported symptoms of clinical burnout may be reflected in the physiology of the body. Acute stress elicits a physiological response that serves to meet the demands of the environment. Heart rate, blood pressure, respiration and glucose synthesis all increase in a state of acute stress, while pathways involved in rest and recovery, such as sleeping and eating, decrease. This fight-flight response ends when the acute stressor disappears. However, when stress is chronic the acute fight-flight response remains on constant alert and may never cease entirely. The body is thought to adapt to the changed demands of the environment, and therefore to adjust to the set points of several physiological systems. This adaptation is called ‘allostasis’. Allostasis is temporarily adaptive, but in the long run may distort physiological system regulation. This damage has been called ‘allostatic load’ (McEwen, 1998), and this state may be reflected in persistent burnout symptoms (Melamed et al., 2006).

The Hypothalamus Pituitary Adrenal axis (HPA-axis) is the stress-physiological system for the long-term adaptation of an organism to stress (Cook, 2002; Sapolsky, Romero, & Munck, 2000) and most studies on the physiology of burnout have, therefore, focused on the deregulation of this physiological system (Raison & Miller, 2003). The HPA-axis has been associated with a hyper-functioning both during acute stress (Sapolsky et al., 2000) and in depressed individuals (Holsboer, 2001). A hypo-functioning of the HPA-axis has been observed in chronic stress-related bodily disorders (Heim, Ehlert, & Hellhammer, 2000) and in fatigue syndromes (Cleare, 2003). Nevertheless, studies on burnout have produced contradictory results concerning either a hyper- or a hypo-functioning of the HPA-axis (for a review see *Chapter 4* or Kudielka, Bellingrath, & Helhammer, 2006, and Melamed et al., 2006).

Instead of conducting a between group study, by comparing burned-out and healthy individuals, we examined the relationship of HPA-axis functioning and the severity of symptoms *within* a clinical burnout sample. We observed slightly lower cortisol levels (i.e. hypo-cortisolism) in the most exhausted burned-out individuals. Also, mornings with higher symptom levels were characterized by somewhat lower cortisol levels and flatter slopes after awakening than days with lower symptom severity in all participants, independent of general symptom severity. Consequently, *within* the burnout group exhaustion severity is (weakly) related to physiological functioning.

Of course, our findings cannot resolve the inconsistencies found in between group studies. They actually seem to be in contrast with the studies that did not find any HPA-axis deregulations (Langelaan, Bakker, Schaufeli, Van Rhenen, & Van Doornen, 2006; Mommersteeg, Heijnen, Keijsers et al., 2006; Mommersteeg, Heijnen, Verbraak, & Van Doornen, 2006a) or that found higher cortisol levels after awakening in clinically burned-out individuals (De Vente, Olff, Van Amsterdam, Kamphuis, & Emmelkamp, 2003; Grossi et al., 2005). However, it is important to note that we examined HPA-axis functioning and the energy dimension of burnout, not the dimensions of cynicism and professional efficacy (the discussion on the three dimensions of burnout appears below). As opposed to burnout when considered as a three-dimensional construct, chronic fatigue is more consistently associated with a hypofunctioning of the HPA-axis (Cleare, 2003; Jerjes, Cleare, Wessely, Wood, & Taylor, 2005; Kudielka et al., 2006; Parker, Wessely, & Cleare, 2001; Roberts, Wessely, Chalder, Papadopoulos, & Cleare, 2004; Scott & Dinan, 1998), though inconsistencies in these studies have also been found (Gaab et al., 2002; Jerjes, Taylor, Peters, Wessely, & Cleare, 2006; Young et al., 1998). If studies would have focused solely on the exhaustion component of burnout, more consistent results might have been found.

In line with this argument, Mommersteeg et al. (2006a) presented the idea that different symptoms in burnout are related differently to physiological functioning. They stated that in burnout 'the HPA-axis deviations associated with severe fatigue (a *hypo* function) may be opposite to the HPA-axis deviations associated with depressive symptoms (a *hyper* function)'. They found no indications for contrasting influences, however. The current thesis argues that the affected reliability of questionnaire assessments by retrospection bias may have produced these null-findings. We found that general symptom severity assessed by questionnaires does not relate to endocrine measures, while general symptom severity assessed with the electronic diary *does* (*Chapter 5).* Therefore, the questionnaire assessments of fatigue and depression in the study of Mommersteeg et al. (2006a) may not have been optimal in studying their suppositions. A replication study with more reliable diary assessments may be more appropriate to test their hypothesis.

Heim et al. (2000) suggested that at the beginning of the burnout process the HPA-Axis may be hyperactive, while in a later stage it switches to a hypo-functioning. Two recent reflections on HPA-axis functioning in burnout consider this idea as a likely possibility (Kudielka et al., 2006; Sonnentag, 2006). Hyper-functioning is considered to be the initial reaction to work stress, and hypo-functioning, characterized by exhaustion, is considered to be a sign of 'giving up'. To test the latter idea the two proposed phases of burnout should be accurately formulated.

In summary, the severity of energy erosion in clinical burnout seems to be reflected, at least to a certain extent, in cortisol and DHEAS levels, the endocrine measures related to HPA-axis functioning. It remains remarkable that between-group studies do not show consistent deregulations in HPA-axis functioning in clinical burnout compared to healthy individuals. Several suggestions have been made for further research. Whatever direction future research may take, the electronic diary seems a superior method for symptom assessment in these studies. The electronic diary may be used to carefully select burned-out individuals, discern subgroups with an expected hyper- or hypo-functioning based on attitudes or mood, or properly examine the possibly counteracting influences of fatigue and depression.

THE ADDED VALUE OF THE ELECTRONIC DIARY METHOD

In the current thesis we used an innovative assessment method to further explore clinical burnout: the electronic diary according to the Experience Sampling Method (Csikszentmihalyi & Larson, 1987). Here we will focus on the results we obtained solely because of the use of this method, to illustrate its advantages over questionnaire assessment. We will make use of the classification as proposed by Bolger et al. (Bolger, Davis, & Rafaeli, 2003) to summarize these advantages.

I. *Reliable person-level information.*
   The electronic diary assesses symptoms a) within the context of everyday life, b) without the influence of retrospection bias, and c) taking into account within-person fluctuations of variables. Therefore, the aggregated individual mean of the diary records is a reliable and ecologically valid index of general symptom severity. This advantage is reflected in the following results:
   - On average, individuals completed 56 symptom diaries on all days of the week, at randomized times of the day. This will furnish a more accurate and representative report of average levels of symptoms than

that obtained by a single retrospective questionnaire record (*Chapter 3 and 4)*.

- The 6-month recovery of symptoms in clinical burnout was reliably assessed by repeating this 2-week diary procedure at follow-up (C*hapter 6)*.
- We showed that non-significant correlations of burnout symptoms and endocrine measures in prior research may be due to the less reliable symptom assessments of burnout questionnaires. Significant albeit modest correlations *were* found when symptoms were assessed by a diary (*Chapter 5)*.
- Finally, we observed that the MBI-exhaustion scale does not accurately display the severity of exhaustion in burned-out individuals on full sick leave, compared to healthy and burned-out individuals that are (partially) working. The lack of observed associations between the MBI-exhaustion scale and exhaustion assessment in the diary in burned-out individuals is probably due to the work-relatedness of MBI-items that are unreliable in participants on full sick leave (*Chapter 2*). We will further discuss this issue below.

II. *Observing within-persons change over time.*
    - We observed no linear increase or decrease of the daily average symptom severity across the 2-week assessment period; this reflects an absence of changes in symptom ratings due to the electronic diary method itself, i.e. reactivity (*Chapter 2*).
    - We observed a U-shaped pattern in fatigue level across the day for all individuals. However, in burned-out individuals this U-shaped pattern was less pronounced than in healthy individuals (*Chapter 3*). After 6 months of treatment, the diurnal patterns of fatigue were similar for both participant groups (*Chapter 6*).

III. *Conducting a causal analysis of within-person changes and individual differences in these changes.*
Besides the examination of individual differences, which is common in psychological research, the electronic diary allows for within-person analyses, which have a stronger potential to reveal causal mechanisms, comparable to that of longitudinal studies.
    - Disturbed sleeping patterns between individuals were not related to poor recovery through sleep. Cross-sectional questionnaire research would have interpreted this finding as indicating that poor recovery

through sleep in burned-out individuals is not influenced by observed sleep disturbances. However, within-person analysis revealed that poor sleep quality in terms of a shorter sleep duration, trouble falling asleep, disruptions of sleep and early awakening all contributed to poor recovery through sleep (*Chapter 4*).

- We observed that fluctuation of exhaustion severity cohered with morning levels of cortisol in clinically burned-out individuals. Irrespective of mean level of exhaustion, the individual displayed higher morning cortisol levels on days with more severe exhaustion in the morning compared to days with less severe exhaustion in the morning. These within-person relationships of exhaustion and cortisol corresponded with the between-person relationships we found in this group (*Chapter 5*).

In addition to improving the accuracy and reliability of the observed results, which are, on their own, important improvements in burnout research, the electronic diary has provided new information on clinical burnout that has been unattainable with common questionnaires.

LIMITATIONS

Our studies know several limitations. We will discuss the most important issues below.

First, we used the most common burnout questionnaire, the Maslach Burnout Inventory (MBI), to select a sample of clinically burned-out individuals. We observed, however, by comparing MBI-exhaustion scores with diary assessments of exhaustion, that the MBI-exhaustion scale does not accurately represent the actual severity of exhaustion in individuals on full sick leave. However, clinically burned-out individuals do report high symptom levels (Roelofs, Verbraak, Keijsers, Bruin, & Schmidt, 2005; Schaufeli, Bakker, Hoogduin, Schaap, & Kladler, 2001). And, the MBI subscales exhaustion and cynicism were able to discriminate between burned-out and non-burned-out employees in a clinical setting (Schaufeli et al., 2001). Still, we cannot assume that the reported levels represent current functioning, which limits the validity of the MBI. Consequently, the use of the MBI in the selection of participants on full sick leave is questionable. Though we used the MBI to select a sample of clinically burned-out individuals, the decisive selection criterion for our clinical sample was meeting the diagnosis of work-related neurasthenia (27), the psychiatric

equivalent of burnout (5). Therefore, we are convinced that the use of the MBI has not led to wrongfully including non-burned-out individuals.

Second, we had chosen, a priori, to examine exhaustion in clinical burnout, and not to focus on cynicism and professional efficacy. This decision was based on two considerations: first, both theorizing and clinical observations furnished ground for the expectation that exhaustion endures during sick leave. And second, cynicism and impaired professional efficacy both pertain to the work environment. The distance from work induced by extended sick leave was expected to affect these tow aspects of burnout more, and in unpredictable ways, than it would affect exhaustion, the core aspect of this syndrome. We thus choose to restrict the analysis to exhaustion, but this is not to say that cynicism and inflated efficacy are not relevant to the state of clinical burnout and its persistence during sick leave. We deliberately excluded these aspects in the present analysis, and we acknowledge that this limits the scope of our studies. We underscore that this exclusion does not imply that we have taken position in the debate of whether or not burnout should be reduced to mere exhaustion (Maslach, Schaufeli, & Leiter, 2001; Schaufeli, Leiter, & Maslach, in preparation; Schaufeli & Taris, 2005). Several researchers reduce burnout to a single fatigue-dimension with accompanying assessment scales (Kristensen, Borritz, Villadsen, & Christensen, 2005; Shirom, 2003). Schaufeli and Taris (2005) as well as Maslach et al. (2001) discourage such an approach, however, because this undermines the relevance of burnout as a distinctive concept to be discriminated from the chronic fatigue syndrome (CFS) (Wessely, 2001). When including participants we did address burnout as a more-dimensional syndrome, using the diagnosis of work-related neurasthenia. In principle we consider the dimensions of cynicism and impaired efficacy as being relevant, but for the reasons explained above we did not focus the present analysis on these dimensions. This should be kept in mind when considering the results.

Third, we included burned-out individuals with co-morbid psychopathology. The results were not obtained in a ‘pure’ burnout sample and may be confounded by co-morbid psychopathology. An argument against this idea is that we found similar results when excluding burned-out individuals with co-morbid psychopathology from the analyses. In a similar vein, we did not find any differences between individuals with and without co-morbid psychopathology. The latter results with respect to the role of co-morbid depression are preliminary however, because of the limited number of participants with co-morbid depression (*n* ranges from 10 to 12 in the different chapters). Our reason to allow for co-morbid psychopathology was that this is common in clinical practice and therefore would allow for a broader generalization of the findings. Our sample included 35% of individuals with a co-morbid psychopathology, mainly mood and anxiety disorders. In a comparable clinical

burnout sample (n = 95) 18% of burnout patients suffered from co-morbid disorders, mainly mood and panic disorders (Roelofs et al., 2005), and 53% of severely burned-out individuals (n = 78) met DSM-IV criteria for depressive disorders in a study by Ahola et al. (2005).

Finally, the relatively high level of education, i.e. more than half of our participants (58%) held a college or university degree, is a limitation to generalization. In comparison, 35% in the general working population and 26% of a mildly burned-out population held a college or university degree (Kant et al., 2004). Figures on education levels in clinical burnout are not available. However, burnout is known to be more common among the lower educated (Ahola et al., 2006; Kant et al., 2004). Therefore we assume that education level in clinically burned-out samples should be even lower than that of mild burned-out or healthy samples. Support for this assumption was found in a study of Mohren et al. where 36 of healthy individuals, 28% of mildly burned-out individuals and 19% of severely burned-out individuals held a college or university degree (Mohren et al., 2003). Although in our view it is questionable that basic symptomatology and physiological correlates will vary much with education level, our results ask for caution when drawing a comparison to a lower educated group of clinical burned-out patients.

IMPLICATIONS FOR CLINICAL PRACTICE

The findings of this thesis have implications for clinical practice. These implications are tentative, however, for two reasons. First, our focus on energetic aspects of clinical burnout, represented by exhaustion and impaired sleep, entails that implications for clinical practice are restricted to these issues. Second, converging evidence in support of our results is needed, as will be outlined below. The implications outlined below are noteworthy, but also are preliminary.

First, since severe burnout appears to be resistant to change and a consequence of a long process of energy erosion, early detection of the ongoing process seems of primary importance. Our results point out that persistent disturbed sleep and neglect of regular periods of recovery constitute important early warning signs of burnout development in employees who are (still) at work. In clinically burned-out individuals it is particularly important to identify poor recovery through sleep and disturbed sleep in the assessment process, because these symptoms indicate a risk for persistence of exhaustion and sick leave. This suggests that the DSM-IV diagnosis of secondary insomnia might be used to add force to the significance of these symptoms (American Psychiatric Association, 1994).

Second, this thesis clarified markers in the presentation of clinical burnout that should be acknowledged in diagnosing the condition when it is fully developed. Our results suggest that clinical burnout can be recognized by: (1) severe and continuous fatigue, (2) feeling drained after awakening, (3) trouble falling asleep and (4) depressed mood, which should be explored concerning its onset, that is: whether or not it followed the energy drain, induced by non-refreshing sleep. We acknowledge that this exploration is likely to be hampered by retrospection. We argue, however, that differential assessment of the occurrence of depressive symptoms within the course of clinical burnout development is important. In addition, diagnostic attention should be drawn to whether or not the person experienced in the episode preceding sick leave chronic stress at work. For the time being, the diagnostician may consider that symptoms of clinical burnout are similar regardless of co-morbid psychopathology.

Third, in spite of clinical validation studies of the MBI-GS (Roelofs et al., 2005; Schaufeli et al., 2001), this questionnaire seems unsuitable for assessment of clinical burnout. Although individuals who fulfill the criteria for work-related neurasthenia and are enrolled in treatment do show higher MBI-GS scores than mildly burned-out individuals (Schaufeli & Van Dierendonck, 2000), in particular on the exhaustion-subscale (Brenninkmeijer & van Yperen, 1999), the MBI-GS exhaustion score does not accurately reflect the current state of an individual on extended absence. In healthy individuals and burned-out individuals that are partially on sick leave and do partially work, the diary assessments and MBI-GS exhaustion score correlated moderately. This moderate correlation in working individuals (either healthy or burned-out) is mainly due to bias induced by remembering and integrating past experiences to constitute an estimate of general symptom severity, which is asked for in retrospective questionnaires like the MBI (Bolger et al., 2003). However, in non-working individuals no relationship between the MBI and diary assessments was observed at all. This is probably due to the fact that these individuals had to fill in a work-related questionnaire, while on sick leave for on average for 4 months (Kant et al., 2004). To our knowledge there is no alternative burnout instrument that is well validated and reliable for a burnout group on extended sick leave, since all questionnaires ask about symptoms in the work context. Therefore, a clinical interview seems the best way to diagnose clinical burnout (as work-related neurasthenia) at this moment.

The present implications pertain primarily to the practice of diagnosing clinical burnout. And this provokes the tempting question whether burnout as a separate diagnosis in medical and psychological practice is justified. It is clear that burnout occurs as a severely disabling mental condition with fairly well known causal mechanisms and mostly in the absence of (other) psychopathology. In my view

these characteristics, i.e. distinctiveness and causal explanations, argue for a separate diagnosis. In the Netherlands a first step in this direction has actually been taken by occupational medicine, where the criteria for burnout are formulated as a mental condition, separate from psychiatric classification systems (Van der Klink & van Dijk, 2003). This is in accordance with suggestions that burnout does not really belong to the psychiatric realm, since it occurs in 'normal' individuals with no pre-morbid psychopathology (Maslach & Schaufeli, 1993). In this context the next question then is: Should burnout be treated differently than related conditions, such as depression? And my tentative answer on this question is, yes. The focus of effective burnout treatment seems to be on time-contingent return to work accompanied by adaptations at work (Blonk et al., 2006; Van der Klink et al., 2003; Van der Klink & van Dijk, 2003). Recovery from energy erosion also seems an important target for treatment, and the reinstatement of daily recovery periods is particular important when work is resumed (Geurts & Sonnentag, 2006; Hobfoll, 2001). The present results underscore the importance of sleep management and sleep hygiene in burned-out individuals on extended leave of absence. Although the effect of sleep focused cognitive behavioral therapy (CBT) in burnout treatment remains to be validated, CBT offers a plausible option to target disturbed sleep patterns and should therefore be actively incorporated in the treatment of burnout. CBT has obtained good results in primary sleep disturbances (Manber & Harvey, 2005). And in psychiatric disorders with secondary sleep problems treatment of these secondary symptoms seems to have a direct effect on the primary disorder (Smith, Huang, & Manber, 2005; Stepanski & Rybarczyk, 2006).

FUTURE RESEARCH

As noted before, the implications outlined above are preliminary, and converging evidence is needed in support of our results. We would like to make some specific recommendations for future research.

We would like to start with an ideal study design. A longitudinal study that quantifies the energy erosion process in (eventually) burned-out employees would help strengthen the COR theory and the proposal of the empty energy tank. Also it might further clarify the determinants of burnout development. It would be equally splendid to observe the moment of calling in sick and the consequences of sick leave on burnout symptoms. Studies of this form would clearly add to the understanding of clinical burnout.

Perhaps it is more realistic and equally important to start with a more elaborate study on disturbed sleep in clinical burnout. Our longitudinal findings on the maintenance

of exhaustion by poor recovery through sleep and the maintenance of sick leave due to disturbed sleep call for replication. The inclusion of objective sleep measures would strengthen the findings of a sleep diary. The role of cognitive arousal or worry before bed-time may be included in the research to examine possible causal relationships between them. This replication study should examine whether poor recovery through sleep and disturbed sleep patterns form a risk factor in all burned-out individuals, or pertain particularly to those that suffer from co-morbid depression. The current thesis has led to the hypothesis that disturbed sleep may play a prominent role in the development of clinical burnout. The idea that it may cause or mediate burnout through chronic sleep debt, for example, should be assessed. Additionally, it seems worthwhile to examine the effects of sleep focused CBT on exhaustion in clinical burnout.

The current thesis compared individuals with clinical burnout and healthy persons. Little is known on the discriminative value of the burnout symptoms assessed in this thesis. A comparison of symptoms between clinically burned-out individuals and individuals suffering from mood or anxiety disorders will elucidate information on the differences between these mental states. Results from such studies will provide evidence for the justification of a separate diagnosis for burnout, as well as, tools for differential diagnosis. Symptom assessments with an electronic diary will be particularly useful in such study designs.

Another issue that deserves attention is the *causal* relation between burnout and co-morbid psychopathology. Does burnout elicit co-morbid psychopathology, is it the other way around, or do both mental problems co-occur? Preliminary evidence suggests a common vulnerability underlying burnout and depression (Middeldorp, Cath, & Boomsma, 2006; Nyklicek & Pop, 2005), and common provoking factors, like high work pressure (Middeldorp et al., 2006) and disturbed sleep. More knowledge on these causal relationships will help specify burnout assessment and treatment in the presence of co-morbid psychopathology. Evidently only longitudinal studies can clarify this issue.

It may be worthwhile to examine the development of cynicism and professional efficacy when an individual calls in sick. Do the appearances of cynicism and professional efficacy change? Will cynical attitudes diminish due to the physical distance created by sick leave? Does sick leave further decrease professional efficacy? Future research may tackle the issue of whether cynicism and professional efficacy continue to play a role during extended sick leave. If so, these burnout dimensions might more clearly distinguish burnout from other mental problems, and will simplify assessment of the syndrome in individuals on extended sick leave.

Finally, the longitudinal study in this thesis showed that a significant part of clinically burned-out employees fully recovers in a 6-month period of psychological treatment. This is good news. However, most individuals needed more time than that. Restoration of energy appears to be difficult and slow to attain. Though work resumption seems to be enhanced by a time-contingent approach, to-date, neither Cognitive Behavioral Therapy nor time-contingent activation appears to promote symptom recovery in clinical burnout (Blonk et al., 2006). Therefore, effort must be put in developing effective burnout interventions.

To conclude: It is time for research to catch up with practice in clinical burnout.

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Nederlandse samenvatting

(Dutch summary)

Hoofdstuk 1: Aanleiding voor het onderzoek

'Mijn moeder zit nog steeds thuis met een burnout'. Dit hoorde ik vaak in informele gesprekken over mijn onderzoek en geeft de indruk dat burnout veel voorkomt in Nederland. Grootschalige epidemiologische onderzoeken bevestigen dit: 16% procent van de Nederlandse werknemers lijdt aan milde burnoutklachten en bij 4% zijn de klachten ernstig. In Finland komt men op vergelijkbare percentages, respectievelijk 25% en 2%. De belangrijkste klacht van mensen met burnout is uitputting door het werk. In de ochtend zijn ze al moe, terwijl de hele werkdag nog voor hen ligt. Na een dag werken hebben ze weinig energie om iets te ondernemen. Daarnaast voelen ze tijdens het werk weinig betrokkenheid bij hun taken. Een verpleegkundige, bijvoorbeeld, spreekt cynisch over 'de psychose van kamer 3' terwijl ze eerder met veel zorg over haar patiënten sprak. Ten slotte hebben mensen met burnoutklachten vaak het gevoel dat ze hun werk niet langer naar behoren kunnen uitvoeren, ontbreekt het hen aan zelfvertrouwen in hun professionele kunnen. Burnoutklachten beïnvloeden dus in eerste instantie het functioneren op het werk. Ernstige klachten kleuren echter ook in sterke mate de privésituatie.

Burnout ontstond als een maatschappelijk probleem in Amerika in de jaren '70 en werd al snel opgemerkt door wetenschappers. Met name arbeids- en organisatiepsychologen pakten het onderzoek op en richtten zich op (nog) werkende mensen met beginnende klachten. De wetenschappelijke kennis over milde burnoutklachten nam hierdoor sterk toe, zoals kennis over het vóórkomen van burnout, de oorzaken, de risicofactoren en het onderscheid met bestaande klachten als depressie. De klachten bleken voornamelijk veroorzaakt te worden door langdurige zware belasting op het werk, door bijvoorbeeld hoge tijdsdruk, conflicten op de werkvloer of weinig beslissingsvrijheid. Vergeleken bij de werkbelasting lijkt de persoonlijkheid van een werknemer maar een kleine rol te spelen in het ontstaan van burnoutklachten. Het gaat eerder om werk dat niet goed bij iemand past, dan om een bepaald type mens dat risico loopt. Ook werd duidelijk dat burnout te onderscheiden is van depressie, al bleek dat beide psychische problemen veel overeenkomsten hebben, bijvoorbeeld in symptomen en uitlokkende factoren.

Klinisch- en gezondheidspsychologen hielden zich tot op heden veel minder bezig met onderzoek naar het verschijnsel burnout. Hier is echter wel noodzaak toe. Burnout leidt regelmatig tot langdurig ziekteverzuim en vaak wordt de hulp ingeroepen van de (geestelijke) gezondheidszorg. Exacte cijfers over het aantal mensen dat landurig in de ziektewet belandt met burnoutklachten zijn er nog niet. Wel is uit wetenschappelijk onderzoek bekend dat burnoutklachten het risico op ziekteverzuim vergroten. Als milde burnoutklachten zich eenmaal hebben ontwikkeld, zijn ze vrij stabiel. Ook ernstige burnoutklachten lijken vooralsnog moeilijk en traag te verhelpen, al zijn hier minder cijfers over bekend. Daarom is het

niet verwonderlijk dat 33% van de nieuwe WAO-aanvragen in de afgelopen jaren toe te schrijven is aan psychische problemen, waarbij burnout een van de meest voorkomende diagnoses is. Burnoutklachten die leiden tot langdurig ziekteverzuim vormen dus een groot maatschappelijk probleem, met een grote weerslag op zowel individu als economie. Hoewel het maatschappelijke probleem dus aanzienlijk is, begint de wetenschap nu pas geleidelijk oog te krijgen voor de mensen die langdurig ziek thuiszittenzitten met ernstige klachten. Door de veelvuldige aanwezigheid van arbeids- en organisatiepsychologen in het burnoutonderzoek en de relatieve afwezigheid van klinisch- en gezondheidspsychologen betreft de huidige burnoutkennis bijna alleen mensen die volledig functioneren op het werk en relatief milde klachten hebben. De kennis van ernstige of *klinische burnout* is echter beperkt. Dit gebrek wordt ook wel het 'heatlhy worker effect' genoemd.

Het gebrek aan onderzoek naar ernstige burnout heeft ook zijn weerslag op de klinische praktijk. Er zijn bijvoorbeeld nog geen eenduidige internationale criteria om burnout vast te stellen. Een Nederlands protocol voor bedrijfsartsen reikt de DSM-IV diagnose aanpassingsstoornis aan, en brengt hier stressklachten, milde burnout en ernstige burnout onder. In Zweden is recent een nieuwe diagnose aan de nationale versie van de ICD-10 (een medische classificatiesysteem) toegevoegd, namelijk 'uitputtingssyndroom' (zie ook appendix III, hoofdstuk 1). In de wetenschap wordt met name de diagnose neurasthenie uit het medisch classificatiesysteem ICD-10 voorgedragen als psychiatrische equivalent van burnout (zie appendix 1, hoofdstuk 1). Deze diagnose vertoont veel overeenkomsten met de vijf kerneigenschappen van burnout die Maslach en Schaufeli in 1993 afleidden uit de vele verschillende wetenschappelijke definities van burnout, namelijk: 1. vermoeidheid, 2. lichamelijke spanningsklachten, 3. de klachten zijn verbonden aan het werk, 4. de klachten worden ervaren door 'normale' mensen, dat wil zeggen niet door mensen die al met een psychische stoornis bekend waren, 5. de werknemer met burnout ervaart dat hij/zij minder effectief kan werken door negatieve opvattingen en gedrag. Gebrek aan wetenschappelijke kennis over klinische burnout heeft ook zijn weerslag op de behandeling van burnout. De laatste jaren is de trend ingezet dat psychologische interventies zoveel mogelijk geënt moeten zijn op wetenschappelijke kennis. Bij voorkeur is er voor elke psychische aandoening een bewezen effectieve behandeling. Door gebrek aan onderzoek is er nog nauwelijks empirisch bewijs voor de effectiviteit van de burnoutinterventies die op dit moment (veelvuldig) worden aangeboden. Toename van wetenschappelijke kennis over klinische burnout zal dus zeker de kwaliteit van burnoutbehandelingen doen toenemen.

Dit proefschrift heeft tot doel om het fenomeen klinische burnout beter in kaart te brengen en beter te begrijpen. Omdat onderzoek hiernaar nog zo schaars is,

hebben we een diepgaande studie opgezet om de symptomen te bestuderen van mensen die langdurig met ziekteverlof zijn wegens burnout. Deze Nederlandse samenvatting volgt de opbouw van het proefschrift. Het proefschrift is als volgt opgebouwd: Hoofdstuk 1 bevat een uitgebreide weergave van bovenstaande inleiding. In hoofdstuk 2 hebben we onderzocht of onze arbeidsintensieve onderzoeksmethode, de elektronische dagboekmethode, haalbaar was bij deze ernstig uitgeputte patiëntengroep. Inhoudelijk gezien ging in hoofdstuk 3 onze eerste aandacht uit naar de hoofdklacht uitputting, met daarbij de vraag of er dagelijks nog dynamiek is waar te nemen in de energieniveaus van deze mensen. Onze tweede vraag, uitgewerkt in hoofdstuk 4, richtte zich op de slaap; hebben mensen met klinische burnout slaapklachten, en zo ja, zijn deze van negatieve invloed op de burnoutklachten zelf? Vervolgens onderzochtten we in hoofdstuk 5 of de ernst van de burnoutklachten ook een fysiologische weerslag heeft in het lichaam (in ochtendwaarden van cortisol en DHEAS). Ten slotte waren we in hoofdstuk 6 benieuwd naar de stabiliteit van klinische burnout. We vroegen ons af of in 6 maanden tijd de klachten bij deze mensen afnamen en het werk hervat werd. Ook hebben we hierbij slaapklachten betrokken als mogelijke hindernis tot herstel. Bij alle bovengenoemde vragen hebben we rekening gehouden met de samenhang van burnout met depressie. We hebben de onderzoeksresultaten telkens gecontroleerd op de mogelijke invloed van depressie. In hoofdstuk 7 vatten we de resultaten uit de verschillende hoofdstukken samen en bediscussiëren we de implicaties voor wetenschap en praktijk.

Hoofdstuk 2: De elektronische dagboekmethode

Om het verschijnsel klinische burnout goed te kunnen bestuderen, hebben we gebruik gemaakt van de elektronische dagboekmethode. Normaliter wordt psychologisch onderzoek uitgevoerd met eenmalige vragenlijsten waarop mensen op één bepaald moment een goede inschatting proberen te maken van hun dagelijkse klachten. Uit onderzoek blijkt dat mensen hun recente klachten niet goed kunnen inschatten, omdat onze herinnering de werkelijkheid altijd in enige mate vervormt. Daarom is de elektronische dagboekmethode ontwikkeld, ook wel Ecological Momentary Assessment (EMA) of Experience Sampling Method (ESM) genoemd. Deze methode vraagt deelnemers een groot aantal momentopnames van de klachten te maken en heeft drie grote voordelen. Ten eerste wordt door het samenvatten en middelen van deze momentopnames een realistischer beeld verkregen van de daadwerkelijk ervaren klachten, zonder de verstorende invloed van herinnering. Ten tweede worden de klachten gemeten in de natuurlijke omgeving van de persoon, wat een realistisch beeld waarborgt (ecologisch valide). Ten derde kan ook de dynamiek van de klachten bestudeerd worden, zoals

veranderingen in de tijd of de onderlinge samenhang van klachten van een persoon. Deze drie voordelen maken de elektronische dagboekmethode uitermate geschikt om klinische burnout in kaart te brengen. In het huidige onderzoek werden deze momentopnames gemaakt met behulp van een palmtopcomputer (PDA of handheld computer). De PDA gaf een alarm als het tijd was voor een momentopname (oftewel voor het invullen van een dagboek). De PDA bood tegelijk de mogelijkheid om het dagboek op het apparaatje zelf in te vullen. Op deze wijze vulden deelnemers 2 weken lang enkele keren per dag een dagboek in.

De elektronische dagboekmethode vraagt veel meer inspanning van een deelnemer dan een eenmalige klachtenlijst. Daarom hebben we in hoofdstuk 2 eerst onderzocht of de elektronische dagboekmethode wel geschikt is voor onderzoek naar klinische burnout, aangezien deze mensen ernstig vermoeid en overbelast zijn. Uit het onderzoek bleek dat de 60 onderzochte mensen met klinische burnout nauwelijks een verstoring van hun dagelijks leven bemerkten en dat ze de methode erg makkelijk in het gebruik vonden. De burnoutpatiënten konden het elektronische dagboek zelfs iets beter waarderen dan de 40 gezonde mensen die we ook gemeten hebben. Het dagboek werd op vooraf onbekende tijden ingevuld en werd aangekondigd door een alarm. Een proefpersoon kreeg gemiddeld 71 alarms in 2 weken en vulde gemiddeld 56 keer ook daadwerkelijk een dagboek in (81%). Na het ontwaken en voor het slapen gaan werden aparte dagboeken ingevuld, namelijk het ochtenddagboek en het avonddagboek. Deze werden maar liefst in respectievelijk 96% en 94% van de gevallen ingevuld. Omdat herhaalde metingen de registratie van de klachten zelf zouden kunnen beïnvloeden, hebben we dit nader onderzocht. We hebben echter geen aanwijzingen voor gewenning aan de klachten (habituatie) of verhoogde aandacht op de klachten (sensitisatie) gevonden. Het elektronische dagboek bleek dus bijzonder goed gewaardeerd te worden door mensen met ernstige burnoutklachten en bleek goede gegevens op te leveren, ondanks de vermoeidheid en overbelasting die deze mensen tekenen.

Hoofdstuk 3: Klinische burnout betekent continue uitputting

Vooreerst hebben we in hoofdstuk 3 met het elektronische dagboek onze focus gericht op de hoofdklacht van burnout: uitputting. In verschillende burnouttheorieën wordt de ernstige vermoeidheid gezien als resultaat van een erosieproces, waarbij langzaam maar zeker de energie wegslijt. De conservation of resources theorie (COR) vertolkt het als volgt: zaken die belangrijk zijn voor een mens om de energiehuishouding op orde te houden (*bronnen*), zoals bijvoorbeeld tijd met het gezin, voldoende slaap of tijd voor sport, worden opgeofferd om de kwaliteit van het werk op pijl te houden. Als dit geruime tijd wordt gedaan, vindt er een kaalslag plaats. COR theorie stelt verder dat als men inteert op deze bronnen, de kans

toeneemt dat andere bronnen ook opdrogen. De uitputting van deze bronnen zet vaak een neerwaartse spiraal in werking. Klinische burnout wordt gezien als het eindstadium van deze spiraal. In dit onderzoek waren we geïnteresseerd in de dagelijkse verschijningsvorm van deze kaalslag. Daarom onderzochten we de dagelijkse dynamiek in energie. In de vermoeidheid van gezonde mensen wordt gedurende de dag namelijk een duidelijk U-curve waargenomen. Onze dagboekmetingen lieten opnieuw zien dat gezonde mensen deze U-curve in vermoeidheid vertonen. Bij de mensen met klinische burnout was deze curve sterk afgevlakt. Zij stonden al vermoeid op, met vermoeidheidniveaus vergelijkbaar met die van gezonde mensen om 23:00 uur 's avonds. Hun vermoeidheid nam nauwelijks af in de loop van de ochtend en nam vervolgens alleen maar verder toe in de middag en de avond. Ook bleek uit onze resultaten dat gezonde mensen zichzelf nauwelijks 'uitgeput' noemen maar 'moe', terwijl de term uitputting wel gebruikt wordt door mensen met burnout. De rek is er dus duidelijk uit bij mensen met klinische burnout. In hoofdstuk 2 zagen we ook dat de mate van vermoeidheid nauwelijks varieerde van dag tot dag, en dat er in beide groepen weinig verschil was in vermoeidheid op week- en weekenddagen. We vonden geen verschillen tussen burnoutpatiënten met en zonder een depressieve stoornis. Dit geeft aan dat een co-morbide depressie geen invloed heeft op de manier waarop de uitputting zich voordoet. Deze resultaten pleiten ervoor dat mensen met ernstige uitputtingsklachten hun bronnen weer hernieuwd belang geven en opnieuw gaan benutten. In andere woorden, de balans tussen inspanning en ontspanning moet worden hersteld. Tijd voor herstel, zoals tijd met het gezin, voldoende nachtrust, tijd om te sporten, moet weer meer prioriteit krijgen ten opzichte van het werk.

Hoofdstuk 4: Slaapproblemen compliceren klinische burnout

In hoofdstuk 4 geven we aandacht aan de belangrijkste herstelperiode bij gezonde mensen: de nachtrust oftewel slaap. Burnoutdefinities stellen dat de burnout-karakteristieke uitputting niet reageert op normale rustperiodes. Het is maar de vraag of deze rustperiodes wel als normaal gekenmerkt kunnen worden. Uit verschillende onderzoeken blijkt dat de slaap zelf ook is verstoord bij burnoutpatiënten. Daarom hebben we onderzocht of slaapproblemen het herstel van energie tijdens de nacht verstoren. Het eerste resultaat van deze studie is dat burnoutpatiënten inderdaad minder herstelden van hun vermoeidheid door hun nachtrust dan gezonde mensen. Ook hadden mensen met klinische burnout last van slaapproblemen. Zij hadden meer problemen met inslapen en voelden zich niet uitgerust na het ontwaken. Ze sliepen echter niet korter, werden niet eerder wakker en werden niet vaker wakker tijdens de nacht in verhouding tot gezonde mensen. Doordat de deelnemers 14 dagen lang direct na ontwaken hun slaapklachten registreerden, zijn we sterk

overtuigd van de robuustheid van onze gegevens. Door deze meetwijze konden we de slaapproblemen ook direct relateren aan de mate van herstel van energie tijdens de nacht. Niet alleen de slaapklachten die typisch zijn voor burnout, maar ook de overige slaapproblemen bleken van invloed op de mate van herstel tijdens de nacht. Als we het onderzoek niet met de elektronische dagboeken maar met vragenlijsten hadden uitgevoerd, waren we waarschijnlijk niet tot deze conclusie gekomen. De gemiddelde ernst van de slaapklachten was namelijk niet gerelateerd aan de gemiddelde mate van herstel tijdens de nacht, terwijl dit mechanisme wel duidelijk naar voren kwam in meer geavanceerde analyses van de dagboekgegevens (multilevel-regressieanalyse). Vanwege de gelijkenissen tussen burnout en depressie hebben we ook hier expliciet gekeken naar de invloed van sombere stemming op onze resultaten. Het bleek echter dat weinig energieherstel tijdens de nacht samenhing met ernstige uitputting en weinig somberheid. Dit lijkt erop te wijzen dat gebrek aan energieherstel door slaap een werkelijk kenmerk is van burnout, en geen verkapt kenmerk van depressie is. Ook bleek dat burnoutpatiënten met een depressieve stoornis niet meer slaapklachten of andere slaapklachten ervaren dan burnoutpatiënten zonder depressieve stoornis. Kortom, we kunnen de huidige resultaten aan het burnoutsyndroom toeschrijven.

Door onze resultaten te vergelijken met andere onderzoeken hebben we reden om aan te nemen dat de zelf-gerapporteerde slaapklachten overeenkomen met objectief waarneembare slaapproblemen. De oorzaak van deze slaapproblemen wordt nog niet goed begrepen. In de discussies over mogelijke verklaringen voert de hyperarousaltheorie de boventoon. Deze theorie stelt dat als iemand zich aan het eind van de dag moeilijk lichamelijk en psychisch kan ontspannen, diens slaap onrustiger en minder diep is. Dit zou volgens de hyperarousaltheorie waarneembaar moeten zijn in de fysiologie van het lichaam. Een ander idee, mogelijk in aanvulling op de hyperarousaltheorie, is dat er bij burnout sprake is van een opeenstapeling van slaaptekort. Slaaponderzoek laat zien dat een beperkt slaaptekort van 2 uur per nacht gedurende een aantal opeenvolgende dagen het functioneren overdag sterk verstoord. Mogelijk is het functioneren eveneens verstoord als er gedurende langere tijd niet diep genoeg geslapen wordt. Of het kan zo zijn dat mensen met burnoutklachten een langere slaapbehoefte hebben dan gezonde mensen. De gelijke duur van de nachtrust in beide groepen duidt dan tóch op een slaaptekort in de burnoutgroep. Het is niet onwaarschijnlijk dat slaapklachten al in een vroeg stadium van het burnout proces optreden, en dus geruime tijd aanhouden. Ondanks dat een eenduidige verklaring nog ontbreekt, is het belangrijk dat we te weten zijn gekomen dat klinische burnout gepaard gaat met slaapproblemen en dat een verstoorde slaap de uitputting in de hand werkt.

Hoofdstuk 5: Burnoutklachten worden licht weerspiegeld in de fysiologie

Hoofdstuk 5 is een psychofysiologische studie naar klinische burnout. Regelmatig is gesuggereerd dat burnoutklachten gereflecteerd worden in de fysiologie van het lichaam. Veel aandacht is uitgegaan naar de hypothalamus-hypofyse-bijnier-as (de HPA-as), een van de belangrijkste stressregulerende systemen in het lichaam. Dit systeem speelt in het bijzonder een rol ten tijde van langdurig aanhoudende stress, wanneer het lichaam zich moet aanpassen aan de aanhoudend hoge eisen van de omgeving. De hormonen cortisol en DHEAS zijn belangrijke maten die de activiteit van de HPA-as weerspiegelen. Het is omstreden of er ontregelingen zijn in het functioneren van de HPA-as bij mensen met burnout. Onderzoeken rapporteren tegenstrijdige resultaten: vergeleken met gezonde mensen wordt bij burnoutpatiënten zowel verhoogde als verlaagde aanwezigheid van cortisol gevonden, en minstens even zo vaak geen enkel verschil. Ook zijn er onderzoeken die zich beperken tot een groep met burnoutpatiënten en binnen deze groep onderzoeken of er een verband is tussen de ernst van de klachten en de mate van cortisol en DHEAS in het speeksel. Totnogtoe hebben onderzoekers geen aanwijzingen gevonden voor zo'n relatie tussen de fysiologische maten en burnoutklachten. In het huidige onderzoek wilden we deze laatste studies, die vragenlijsten gebruikten om klachten te meten, repliceren met het elektronisch dagboek. Zoals eerder vermeld, geeft de elektronische dagboekmethode een betrouwbaarder beeld van klachten dan eenmalige retrospectieve vragenlijsten, omdat er geen vertekening door herinnering optreedt. Het is mogelijk dat deze betrouwbare klachtenmetingen wél een relatie vertonen met fysiologie. Daarnaast stelde de elektronische dagboekmethode ons ook in staat om de relatie tussen cortisol/DHEAS en burnoutklachten te berekenen op één bepaald moment. Normaliter wordt er een verzamelmaat voor klachten en een verzamelmaat voor fysiologische parameters gebruikt. Door te kijken naar de relatie van fysiologie en psychologie op exact hetzelfde moment worden mogelijk andere resultaten gevonden. Op 3 opeenvolgende dagen binnen de dagboekperiode verzamelden deelnemers 4 buisjes met speeksel in het eerste half uur na ontwaken (0, 15 en 30 minuten na ontwaken, waarbij na 30 minuten twee buisjes werden verzameld). In ons onderzoek vonden we, toch onverwachts, wél een zwakke negatieve relatie tussen de ernst van de klachten en cortisol en DHEAS: hoe ernstiger een burnoutpatiënt was gekenmerkt door uitputting, des te lager was het cortisol niveau en des te kleiner de stijging van cortisol na ontwaken. Ook de cortisol/DHEAS-ratio was in dat geval kleiner. Al deze maten duiden op een verminderde werking van de HPA-as. Ook was er een sterkere verlaging van het cortisolniveau in de ochtend nadat de avond ervoor synthetisch cortisol was ingenomen, duidend op een versterkte terugkoppel-functie van de HPA-as. Deze relatie werd zowel gevonden

voor de verzamelmaten, als voor de metingen op exact hetzelfde moment. De metingen op het hetzelfde moment waren echter robuuster, omdat zij ook gevonden werden als we de metingen niet meenamen (1) waarin geen toename van cortisol na ontwaken werd gezien (een teken dat de proefpersoon mogelijk niet direct na ontwaken het speeksel heeft verzameld), en (2) van mensen met co-morbide psychopathologie. Op dagen dat een burnoutpatiënt meer uitputting ervaarde, leek ook de HPA-as verminderd actief. Dit was slechts een zwak verband, en kan het gevolg zijn van de beperkte hoeveelheid aan metingen. We vonden dus aanwijzing voor een verminderde functie van de HPA-as bij ernstiger uitgeputte burnoutpatiënten vergeleken met minder uitgeputte burnoutpatiënten. Deze bevinding is ronduit moeilijk te interpreteren en vergt nader onderzoek vanwege de vele tegenstrijdige bevindingen in onderzoek met burnoutpatiënten én gezonde mensen. Wel lijkt dit onderzoek nieuw bewijs te leveren voor de hogere betrouwbaarheid van de elektronische dagboekmethode ten opzichte van een eenmalige vragenlijst. Zeer waarschijnlijk leidt gebruik van deze nieuwe methode tot nieuw inzicht in de psychofysiologie van burnout.

Hoofdstuk 6: Volledig herstel van klinische burnout is mogelijk

In hoofdstuk 6 beschrijven we een longitudinale studie naar klinische burnout. Na 6 maanden vulden de burnoutpatiënten opnieuw 2 weken lang het elektronische dagboek in. Op moment van de follow-up meting was de eerste dag van ziekmelding gemiddeld 10 maanden geleden. Met deze follow-up meting wilden we in kaart brengen in welke mate er na 6 maanden klachtherstel en werkhervatting heeft plaats gevonden bij mensen met klinische burnout. Milde burnoutklachten blijken over langere tijd vrij stabiel, terwijl over het voortduren van ernstige klachten veel minder bekend is. Het zou erg verontrustend zijn als ernstige klachten die tot langdurig ziekteverzuim leiden dezelfde stabiliteit kennen als milde klachten. Onze resultaten lieten zien dat er na 6 maanden een sterke daling was op alle gemeten klachten: uitputting, herstel van energie tijdens de nacht, slaapproblemen en somberheid. Het dagelijks verloop van vermoeidheid bij burnoutpatiënten liet weer een gezonde dynamiek zien (U-curve), mogelijk een eerste teken van herstel. Er waren nog wel duidelijke verschillen tussen de klachtenniveaus van gezonde mensen en burnoutpatiënten, dus over de gehele groep genomen was er nog geen sprake van volledig herstel. Ruim eenderde van de burnoutgroep (37%) was weer volledig aan het werk, en krap eenderde gedeeltelijk (29%). De groep die volledig het werk had hervat, bleek ook volledig hersteld van de uitputting en somberheid (i.e. vergelijkbaar met gezonde mensen). Deze herstelde groep werd al bij de eerste meting gekenmerkt door de afwezigheid van slaapklachten, wat nog steeds gold bij de follow-up. In de regressieanalyses bleek inderdaad dat de ernst van de

inslaapproblemen en het niet uitgerust wakker worden (de typische slaapproblemen bij burnout) voorspellend waren voor volledige werkhervatting. Anders gezegd, mensen met minder slaapklachten zijn eerder weer volledig aan het werk. Daarnaast bleek ook dat mensen met klinische burnout die relatief goed konden uitrusten tijdens de nacht na 6 maanden minder uitgeput waren. Deze resultaten laten zien, net als in hoofdstuk 4, dat slaapproblemen een complicerende rol spelen in klinische burnout. Ook hier wilden we zeker zijn dat onze resultaten niet werden vertekenend door de aanwezigheid van een depressie. We vonden echter dat in de analyses zonder de mensen met depressieve klachten de slaapklachten niet meer (sterk) voorspellend waren voor herstel. Dit kan komen doordat in kleine groepen moeilijker een effect wordt aangetoond, en in dit longitudinale onderzoek was de klinische burnout groep niet heel groot. Het zou ook kunnen dat slaapklachten het herstel slechts bemoeilijken bij mensen die naast klinische burnout ook lijden aan een depressieve stoornis. Dit verdient nader onderzoek. Samenvattend kan worden gesteld dat het voor veel mensen mogelijk is om volledig te herstellen van ernstige burnoutklachten. Een burnoutpatiënt met ernstige slaapklachten heeft minder kans om snel te herstellen. Tot slot willen we nog opmerken dat in onze onderzoeksgroep de meeste mensen een bepaalde vorm van psychologische behandeling ontvingen. Mogelijk is deze behandeling van invloed geweest op het herstel. Deze invloed hebben we helaas niet expliciet kunnen maken in dit onderzoek, omdat we geen vergelijkbare burnoutgroep hebben gevolgd zonder therapie. Toch geeft het huidige onderzoek een goed beeld van de herstelverwachting bij mensen met klinische burnout die een - voor Nederland - gebruikelijke route tot herstel volgen.

Hoofdstuk 7: Conclusies en aanbevelingen

Hoofdstuk 7 bevat een samenvatting en kritische bespreking van de resultaten van het gehele onderzoeksproject. Het belangrijkste resultaat van dit onderzoek is dat het fenomeen klinische burnout beter in kaart is gebracht: Klinische burnout wordt gekenmerkt door (1) dagelijkse ernstige uitputting met weinig dynamiek gedurende de dag, (2) een verstoord herstel van vermoeidheid tijdens de nacht en (3) slaapproblemen die het herstel tijdens de nacht in de weg staan. Hoewel burnoutpatiënten ook gekenmerkt worden door een sombere stemming, hebben we nieuwe aanwijzingen gevonden voor de veronderstelling dat klinische burnout een ander fenomeen is dan depressie. De ernst van de uitputting kent een zekere weerspiegeling in cortisol en DHEAS; in de meest ernstige burnoutgevallen is er sprake van een hypofunctioneren van de HPA-as. Een grote groep mensen herstelt volledig van ernstige burnout binnen 6 maanden. Mensen met ernstige slaapklachten hebben hier minder kans op. De elektronische dagboekmethode heeft ons in staat gesteld om tot deze robuuste en vernieuwende resultaten te komen.

Dit onderzoek heeft implicaties voor de klinische praktijk, en we noemen hier de belangrijkste. Allereerst zal de klinische representatie van klinische burnout, zoals hierboven beschreven, bijdragen aan het herkennen van werknemers die met deze problematiek kampen. Natuurlijk geldt hier de kanttekening dat de klinische beschrijving beperkt is tot de klachten die wij gemeten hebben, en dat er nog andere kenmerken denkbaar zijn. De tweede en misschien wel de belangrijkste implicatie is dat een vroege herkenning van slaapklachten en succesvolle behandeling daarvan belangrijk zijn om het herstel van burnout te bespoedigen. Ten slotte is gebleken dat de meest gebruikte burnout screeningsvragenlijst, de Utrechtse Burnout Schaal (UBOS), problemen oplevert bij mensen met langdurig ziekteverzuim. De UBOS vraagt naar klachten voorafgaand, tijdens en na een werkdag. Door de werkgerelateerde wijze van vragen geeft de UBOS een sterk vertekend beeld van de werkelijk ervaren klachten bij patiënten in de ziektewet. Op dit moment lijkt een klinisch interview de beste manier om klinische burnout te diagnosticeren (vooralsnog bij voorkeur als werk-gerelateerde neurasthenie, zie Appendix I, p.29).

Ook willen we enkele aanbevelingen doen voor toekomstig onderzoek. Het lijkt met name zinvol de rol van slaapklachten beter in kaart te brengen, zowel in de ontwikkeling van burnout als in het herstel ervan. Naast een elektronisch dagboek zullen objectieve slaapmetingen in een dergelijk onderzoek van waarde zijn. Er is ook meer kennis nodig over de verklarende mechanismen van slaapproblemen. Een studie naar piekergedrag en ontspanning voor het slapen zou hieraan kunnen bijdragen. Een andere logische stap in het onderzoek naar burnout is het verglijken van de klachten van mensen met klinische burnout met mensen met andere psychische stoornissen, zoals depressie of angststoornissen, om zo tot een duidelijker onderscheid te komen (differentiaal diagnostiek). Ook onderzoek naar de twee andere kernsymptomen van burnout naast uitputting, i.e. een cynische houding en een aangetaste geloof in eigen kunnen, zou kunnen bijdragen aan een scherper onderscheid. Ten slotte is er op dit moment nog erg weinig bewijs voor effectieve psychologische interventies bij klinische burnout. Hoewel we hebben laten zien dat een groot aantal burnoutpatiënten binnen 6 maanden herstelt, is een groot deel nog niet volledig hersteld. Er is dus grote behoefte aan voortgaand onderzoek naar succesvolle interventies. De resultaten van het huidige onderzoek wijzen in de richting van slaapinterventies, maar ook deze aanbeveling behoeft empirische ondersteuning.

Hoewel we met het huidige onderzoek een mooie stap hebben kunnen zetten, staat het onderzoek naar klinische burnout nog aan het begin. Er is voldoende aanleiding en ook noodzaak om de theoretische en praktische kennis over klinische burnout verder uit te breiden in de komende jaren.

Curriculum Vitae

Mieke Sonnenschein was born on April 17th 1978 in Amsterdam, the Netherlands. In 1996 she started studying at the department of Psychology of the Free University (VU) in Amsterdam. She obtained her Masters degree in Clinical Psychology in 2001. Her Masters research project was the occurrence and development of psychopathology in patients with unexplained cardiac complaints. Subsequently she started with her PhD-project on clinical burnout in 2002 at the department of Clinical and Health Psychology at Utrecht University, under the supervision of Marjolijn Sorbi, Lorenz van Doornen and Wilmar Schaufeli. During her thesis, she worked as well as a clinical psychologist in primary care at 'De Pionier' in Amsterdam. As from January 2007 she works as a clinical psychologist in primary care again, now at 'Ichthus Groep' in Katwijk, and specializes in burnout treatment. Moreover, she continues to coordinate a research project on the implementation of the electronic diary in treatment of somatoform disorders, which is a collaboration of Utrecht University and Centre of Excellence for Psychosomatic Medicine; Eikenboom, Altrecht GGZ.

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