

## Insufficient Sleep Predicts Clinical Burnout

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The present prospective study aimed to identify risk factors for subsequent clinical burnout. Three hundred eighty-eight working individuals completed a baseline questionnaire regarding work stress, sleep, mood, health, and so forth. During a 2-year period, 15 subjects (7 women and 8 men) of the total sample were identified as “burnout cases,” as they were assessed and referred to treatment for clinical burnout. Questionnaire data from the baseline measurement were used as independent variables in a series of logistic regression analyses to predict clinical burnout. The results identified “too little sleep (<6 h)” as the main risk factor for burnout development, with adjustment for “work demands,” “thoughts of work during leisure time,” and “sleep quality.” The first two factors were significant predictors in earlier steps of the multivariate regression. The results indicate that insufficient sleep, preoccupation with thoughts of work during leisure time, and high work demands are risk factors for subsequent burnout. The results suggest a chain of causation.

*Keywords:* sleep, burnout, exhaustion, work demands, recovery

Sickness absence attributable to stress-related diseases, with a heavy emphasis on fatigue and psychological ill-health, is a growing health problem in many Western countries (Riksförsäkringsverket, 2003; Weber & Jaekel-Reinhard, 2000). Lacking a distinct conceptualization of the stress-related exhaustion, “burnout” has become an assembling term in daily language (Weber & Jaekel-Reinhard, 2000). Burnout refers to a negative affective state, including emotional exhaustion, physical fatigue, and cognitive weariness resulting from chronic stress (Melamed, Kushnir & Shirom, 1992). Melamed, Shirom, Toker, Berliner, and Shapira (2006) have described burnout as a depletion of the individual’s energy resources as a result of long-term exposure to work stress and (or) sustained strain in daily life. In the ICD-10 (the 10th revision of the International Classification of Dis-

eases), burnout is included (Z73.0) as “a state of vital exhaustion” (World Health Organization, 1992). The Swedish National Board of Health and Welfare added in 2005 “Exhaustion syndrome” as a supplementary diagnosis to the Swedish version of the ICD-10 to more fully describe the condition (Socialstyrelsen, 2003, 2005). The diagnostic criteria include excessive and persistent fatigue, emotional distress, and cognitive weariness related to long-term stress exposure (Socialstyrelsen, 2005). In the present article, the term “burnout” will be used throughout because it was the term used at the start of the study.

The work conditions have radically changed during the last decades. The 24-hr society has weakened the natural boundaries of day and night, and blurred the borders between work and leisure time. Together with high work demands, this may contribute to sustained activation, which, according to the allostatic load model (McEwen & Stellar, 1993; McEwen, 2004), may have a negative impact on health in the long run, in particular if adequate recovery as rest and sleep is not provided.

Burnout is assumed to be caused by long-term stress. Cross-sectional data indicate that the effect of work stress on burnout seems to involve high job strain, including high work demands and low levels of influence or control at work (Demerouti, Bakker, Nachreiner F, & Schaufeli, 2001; Maslach, Schaufeli, & Leiter, 2001; Perski et al., 2002; Schaufeli & Enzmann, 1998). Also several prospective studies have demonstrated the effect of high job demands and workload on emotional exhaustion. In their prospective study, using a representative sample of 3004 workers, Magnusson Hanson, Theorell, Oxenstierna, Hyde, and Westerlund

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(2008) found significant effects on emotional exhaustion symptoms of high work demands, as well as of low decision authority, lack of support at work and downsizing. Sonnentag, Binnewies, and Mojza (2010) showed that high job demands predicted emotional exhaustion, psychosomatic complaints, and low work engagement over time. Further, Sundin, Hochwälder, and Lisspers (2011) found that job demands and professional worries were associated with emotional exhaustion. The chain of causation between work stress and burnout may be direct, but there is also a possibility that sleep and recovery from stress may be involved as a mediator.

We learn from several cross-sectional studies that occupational stress, including effects of job strain (Ota et al., 2005), overcommitment, and effort-reward-imbalance (Fahlén, 2006; Ota, 2005), are associated with disturbed sleep (Urponen, Vuori, Hasan & Partinen, 1988; Åkerstedt et al., 2002). Prospective studies on the relationship between work stress and sleep are scarce, but one prospective study by Linton (Linton, 2004) showed that “poor psychosocial work environment” doubled the risk of developing a sleep problem over a course of one year.

We also know that sleep complaints are present in burnout subjects (Grossi, Perski, Evengård, Blomkvist, & Orth-Gomér, 2003; Melamed et al., 1999; Vela-Bueno et al., 2008), as are physiological indicators of impaired sleep (Ekstedt et al., 2006; Ekstedt, Söderström, & Åkerstedt, 2009; Söderström, Ekstedt, Åkerstedt, Nilsson, & Axelsson, 2004). Sleep is restorative for daily functioning, whereas sleep deprivation seems to make us more sensitive to emotional and stressful stimuli and events (Vandekerckhove & Cluydts, 2010). Thus, sleep seems to buffer negative affects of stress. Furthermore, reduced sleep will cause burnout-like symptoms, such as fatigue, sleepiness, and impaired cognitive functioning (Harrison & Horne, 1999; Nilsson et al., 2005; Van Dongen, Maislin, Mullington, & Dinges, 2003). Fragmented sleep has similar effects (Bonnet, 1985; Bonnet, 1989). McEwen (2006b) has pointed out that sleep has important homeostatic functions and, hence, disturbed sleep may contribute to allostatic load with possible negative impact, in the long run, on the brain and the body.

Geurts and Sonnentag (2006) put forward a model in which incomplete recovery is suggested to mediate the relation between the exposure to stressful working conditions and the development of health problems. The authors argue that prolonged exposure to work demands and cognitive stress-related processes, such as rumination or anticipation, are two conditions that may impede the recovery process by sustaining physiological activation. Perseverative cognition, such as rumination over past stressors and anticipation about potential future stressors, has been associated with increased activity in various bodily systems, during sleep as well as during waking, and such sustained activation may mediate the prolonged effects of stressors on physiology and on disease (Brosschot, 2010; Brosschot, Pieper & Thayer, 2005). This fits with the allostatic load model, as psychological states, such as anxiety or rumination (worry), can contribute to the activation of bodily stress reactions. Sonnentag et al. (2010) showed, in line with this, that the inability to psychologically detach from work during free time predicted emotional exhaustion, and, the other way around, being able to disengage from work during free time was shown to buffer the relation between job demands and psychosomatic complaints, as well as the relation between job de-

mands and decreased work engagement. In another study, Sonnentag and Bayer (2005) showed that working subjects who were able to detach psychologically from work during evenings reported more positive mood and less fatigue.

Building upon the allostatic load model (McEwen & Stellar, 1993; McEwen, 2004), the recovery model of Geurts and Sonnentag (2006), and the relation between work stress, sustained cognitive activation, sleep disturbance, and burnout referred to above, it seems a reasonable hypothesis that insufficient or impaired sleep attributable to stress may play an essential role in burnout development. Also impaired recovery during waking, in the sense of having difficulties to unwind or disengage from cognitive processing during free time, can be one important link in the relation between work demands and disturbed sleep. As was shown in the study of Åkerstedt et al. (2002), using a large representative sample of subjects, the item “cannot stop thinking about work in the evening” was modifying the effect of work demands and became the strongest predictor of disturbed sleep. This points to the *response to the stress*—or the *ability to recover from stress*—as an important predictor of negative health outcomes, not the stress per se. Hence, we suggest an incomplete recovery pathway to burnout development as elevated work stress may contribute to sustained activation through preoccupation with thoughts of work during leisure time, and to impaired sleep. This taken together, may, in the long run, lead to burnout.

To date, however, studies with prospective approaches on the relationship burnout and insomnia are scarce. One of the few is the study of Armon, Shirom, Shapira, and Melamed (2008), in which the authors found that burnout and insomnia recursively predicted each other's development over time. Another study with a prospective design is the one of Jansson-Fröjmark and Lindblom (2010). In the latter, a randomly selected sample from the working population were screened on insomnia and burnout questionnaires over the course of a year. The results of the longitudinal analyses demonstrated that insomnia and burnout were not bidirectionally related. While insomnia was linked to the maintenance of emotional exhaustion (the central part of burnout), burnout was not related to future insomnia. However, the above studies only included nonclinical subjects. In a study of burnout subjects on sick leave, Sonnenschein et al. (2008) found that sleep complaints predicted a delayed return to work. Another study of Sonnenschein, Sorbi, van Doornen, Schaufeli, and Maas (2007) focusing on clinically burned-out subjects showed that impaired recovery through sleep was related to severity of exhaustion, but not to severity of depressive mood, indicating that the energy depletion in burnout is a symptom of nonrecuperative sleep, not a sign of depression. Ekstedt et al. (2009) investigated the role of sleep physiology in recovery from clinical burnout, and found that recovery from fatigue (the core symptom of burnout) was related to a reduction of microarousals during sleep, and the best predictor of return to work. The above referred to results point to an important, predictive role for sleep in both the phase preceding burnout as well as in the recovery process.

Most of the past studies on burnout have established the presence of burnout on the basis of subjective scores (often statistically derived cut-off scores) on the Maslach-Burnout Inventory, MBI (Maslach, Jackson, & Leiter, 1996), or the Shirom-Melamed Burnout Questionnaire, SMBQ (Kushnir & Melamed, 1992; Melamed et al., 1992). Possibly, this could be a methodological weakness

because the questionnaire scores do not have the ecological validity of a clinical evaluation. The latter has the advantage of also evaluating the burnout symptoms' effect on work performance and daily life.

In the present article we aimed to investigate the following research questions:

- 1) Are aspects of work stress, impaired recovery during leisure time (sustained activation), and sleep, independently, predicting subsequent clinical burnout?
- 2) When controlling for the effect of work stress, are there additional effects of impaired recovery during leisure time (sustained activation), and (or) impaired or insufficient sleep, on clinical burnout development?

To investigate the above, a prospective field study was designed in collaboration with an IT company and a stress clinic.

## Method

### Participants

The research project was conducted at an IT-company subjected to a high production pressure. Information about the project and a baseline questionnaire concerning stress at work, health, sleep, and lifestyle was distributed to all 676 employees. Three hundred eighty-eight employees completed the questionnaire. There was a widespread opinion among the employees that the work was stressful; 43% of all responders to the baseline questionnaire rated high work stress during the last year.

During a period of 2 years from the baseline measurement, employees who were experiencing pronounced fatigue or stress symptoms, together with impaired work ability, were asked to contact the company's health service department for assessment and further help. During the study period, 32 employees sought medical help for this reason and were assessed by a certified clinical psychologist. Of these, 15 were found matching the inclusion criteria of the study, classified as "burnout cases" and referred for treatment at a stress clinic. The clinical assessments and referrals, that is, inclusion into the study, occurred successively, and was evenly distributed during the project time. Stress was continuously present in the work situation, and no new specific stressor occurred during the time period the clinical assessments and referrals were conducted. The included subjects were primarily working with software programming, help-desk services, and security aspects regarding the use and implementation of the IT systems. Hence, the subjects did not come from a single unit.

When the study was carried out sickness absence attributable to stress-related health complaints doubled in the Swedish population, and the National Board of Health and Welfare was coordinating work on establishing criteria for a diagnosis of clinical burnout. In this study we used inclusion criteria based upon a preliminary approach from the group of researchers and clinicians involved in the work on these diagnostic criteria. These were as follows:

- 1) Symptoms of exhaustion (physical, emotional and/or cognitive) during  $\geq 2$  weeks.

- 2) The symptoms have developed because of one or more identifiable stressors, which have been present for  $\geq 6$  months.
- 3) The symptoms cause a clinically significant suffering or a reduced ability to function at work, socially, or in other important aspects.

The clinical assessments were conducted by a certified psychologist trained by a senior clinician (psychologist) with expertise on clinical burnout. After the project, the clinical assessment records were reexamined by the clinician who did the assessments and by the senior clinician. The reexamination was done "blind" to test-retest the assessments, and the interrater reliability was 1.0. All subjects were found to fulfill the, at that time, established diagnostic criteria for exhaustion syndrome and were included in the analyses presented in this paper.

Of the 15 participants, seven were women and eight were men. Mean age of the participants was  $36.1 \pm 5$ , mean time employed in the company was  $33.7 \pm 37.6$  months. Mean score on the four-graded SMBQ (from the baseline questionnaire) was  $2.26 \pm .6$ . On the HADS-Depression scale, mean score was  $5.0 + 4.4$ , and on the HADS-Anxiety scale mean score was  $6.8 \pm 4.8$  (Zigmond & Snaith, 1983), well under the clinical cut-off scores for depression and anxiety. None of the included subjects suffered from any ongoing psychiatric disease as defined by *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR;* American Psychological Association, 1994). All were referred to the same stress clinic for treatment for clinical burnout. For eight subjects, the referral to the stress clinic became the start of a long-term sick-leave period ( $\geq 4$  weeks). The other seven subjects continued working throughout the treatment period.

### Measurements

All information on psychosocial, behavioral, and health variables was assessed by a computer-based questionnaire administered through the company's intranet. In the present study variables regarding work stress, sleep, sustained activation during leisure time, burnout, and other health complaints were in focus. Measures used for sleep, burnout, anxiety, and depression were all well-established scales (see below for details). Regarding work stress, we used scales measuring work demands, decision latitude, social support at work, and sustained activation during off-work time. The scales were based on a factor analysis of the baseline questionnaire and included items from the Karasek-Theorell Demand-Control-Support model (Theorell & Karasek, 1996) and from the overcommitment scale (Siegrist et al., 2004). Also, some items which possibly fit the particular organization were added to investigate the work conditions in more detail, including aspects of the "limitless" work stress in the 24-hr society. All included scales and measures are described more thoroughly below.

**Work demands.** Ten items were included in the index "Work demands," based on a factor analysis of the initial questionnaire (Cronbach's alpha: .85), as follows: "I have to work very hard to be able to handle the demands at work," "There is insufficient time for the work to be done," "There are conflicting demands in my work situation," "The work demands are unreasonably high," "Work is for me often associated with a great amount of psycho-

logical strain," "My work never gets finished no matter how hard I work," "I interact with too many people at work," "Too many people want part of my time at work," "I am often interrupted at work," "My work means too much responsibility." Response alternatives were 1–4 (*I do not agree–I fully agree*).

**Social support from supervisors.** Four items were included in the index "Support from supervisors," based on a factor analysis of the initial questionnaire (Cronbach's alpha: .86): "My supervisor at work is treating me with respect," "My supervisor supports me in difficult situations," "I trust my supervisor," "My supervisor cares for me." Response alternatives were 1–4 (*I fully agree–I do not agree*).

**Social support from colleagues.** Five items were included in the index "Support from colleagues," based on a factor analysis of the initial questionnaire (Cronbach's alpha: .83): "My colleagues are treating me with respect," "I like my colleagues," "There is a good social atmosphere at work," "Conflicts at work are easily solved," "Colleagues are loyal toward each other." Response alternatives were 1–4 (*I fully agree–I do not agree*).

**Decision latitude.** Three items formed the index "Decision latitude," based on a factor analysis of the initial questionnaire (Cronbach's alpha: .88): "I can decide how my work is done," "I can decide what to do at work," "I have the information I need to do my work." Response alternatives were 1–4 (*I fully agree–I do not agree*).

**Sustained activation.** The short form of the overcommitment scale presented by Siegrist et al. (2004) included six items. In this study we used three of them to measure the degree of sustained activation in the form of preoccupation with thoughts of work (or the ability to psychologically switch off from work) during leisure time. The index was here called "Thoughts of work during leisure time" and included the following items: "As soon as I get up in the morning I start thinking about work problems," "Work rarely lets me go, it is still on my mind when I go to bed," and "When I get home, I can easily relax and 'switch off' work" (Cronbach's alpha: .93). Response alternatives were 1–4 (*I do not agree–I fully agree*, revised for the latter item). Compared with the six-item version of the scale that Siegrist proposed in 2004, the item "If I postpone something that I was supposed to do today I'll have trouble sleeping at night," was excluded as it contained a representation of the possible outcome. Also excluded were the items "I get easily overwhelmed by time pressure at work" and "People close to me say I sacrifice too much for my job," as they, based on the results from factor analysis (data not presented), did not seem to measure the factor of sustained cognitive activation (preoccupation with thoughts of work during leisure time) that we aimed to measure in this study. Also, the separate items "bringing work home" and "working on weekends" were used in the present study as measures of behavioral aspects of sustained activation. Response alternatives for these two items were 1–5 (*Not at all–To a very high degree*).

**Sleep.** The Karolinska Sleep Questionnaire, KSQ (Åkerstedt, Knutsson et al., 2002) assesses habitual sleep quality on three dimensions: Sleep quality (including the items "impaired sleep quality," "frequent awakenings," "troubles falling asleep," and "troubles sleeping throughout the allotted time"), Sleepiness ("sleepy during work and leisure time," "tired eyes," "involuntary naps at work," "involuntary naps during free time"), and Impaired awakening ("difficulties rising" and "not well rested after sleep").

The response alternatives were 1–5 (*never–almost every night*). Also the item "too little sleep (<6 hours)," with the response alternatives 1–5 (*never–almost every night*), was used in the analyses to test the effects of insufficient, short sleep.

**Burnout.** Burnout symptoms were measured by the Shirom-Melamed Burnout Questionnaire (SMBQ) (Kushnir & Melamed, 1992; Melamed et al., 1992). The SMBQ consists of a list of 22 symptom sentences measuring different facets of the burnout syndrome; emotional exhaustion and physical fatigue (eight items like "I feel tired," "My batteries are emptied," "I am fed up"), tension (four items like "I am tense," "I feel restless"), listlessness (four items like "I feel full of vitality," "I feel active," reversely scored), and cognitive weariness (Kushnir & Melamed, 1992) (six items like: "I feel disorganized lately," "My head is not clear"). For purposes of data reduction the overall burnout index (mean score) was calculated for each subject, with a reliability coefficient (Cronbach's alpha) of 0.90. This index was highly correlated with the emotional exhaustion subscale of the Maslach's Burnout Inventory (Maslach et al., 1996) and with Pine's Burnout measure (Pines, Aronson, & Kafry, 1981) in a study of burnout in women (Grossi et al., 2003). A modified four-point graded version of the SMBQ was used (1 = *almost never*, 4 = *almost always*). The four-graded scale correlated highly with the original seven-graded scale ( $r = .78, p < .001$ ) (Söderström, Ekstedt et al., 2004). The SMBQ-values presented in this article are from the baseline measurement, as SMBQ was to be used in the regression analyses as a predicting variable.

**Anxiety and Depression.** The Hospital Anxiety and Depression scale (HADS) was used to establish degree of anxiety and depression (Zigmond & Snaith, 1983). HADS has been evaluated in different groups and found useful because of its brevity, simplicity, and lack of effect of somatic conditions (Hopwood, Howell, & Maguire, 1991; Ibbotson, Maguire, Selby, Priestman, & Wallace, 1994; Zigmond & Snaith, 1983). It has shown strong correlations with the Beck Depression Inventory and Spielberger's State Trait Anxiety Inventory in a Swedish sample (Lisspers, Nygren, & Söderman, 1997).

**Health complaints.** The questionnaire also included questions regarding health complaints such as pain, heart and stomach symptoms, and persistent fatigue.

## Statistical Analyses

Three different statistical analyses were computed. In a first step, univariate logistic regression analyses were computed with "burnout case" as the dependent variable and data from the baseline questionnaire as independent variables. The independent variables were aspects of work stress, sustained activation, sleep, and physical symptoms. Also, depression, anxiety, health complaints, and demographic variables were used as independent variables in the univariate regression analyses. Second, binary correlations between the significant variables from the univariate regression analyses were computed to investigate interrelations between the different factors used in the multiple approach. Third, a multiple hierarchical logistic regression analysis was computed to test whether impaired or insufficient sleep predicts burnout, controlling for work stress and sustained activation. Variables that showed no significant predictive result in the univariate analyses were ex-

Table 1  
Univariate Logistic Regression Analyses With Burnout Case as Dependent Variable

Type of factors	Independent variable	ExpB	CI lower	CI upper	p
Background	Sex	0.74	0.26	2.09	.575
	Age	1.01	0.94	1.08	.742
	Children (<7 yrs)	0.96	0.35	3.16	.922
	Single	0.34	0.24	2.04	.525
Work	Work demands	4.48	1.59	12.60	.004
	Decision latitude	1.26	0.53	3.00	.605
	Support from managers	1.16	0.53	2.56	.706
	Support from colleagues	1.75	0.51	6.02	.376
	Satisfaction with work	1.78	0.45	1.33	.358
	Experience in the company (yrs employed)	1.00	0.99	1.01	.806
Sustained activation	Bringing work home	0.72	0.47	1.12	.147
	Working during weekends	0.66	0.37	1.17	.153
	Thoughts of work during leisure time	3.10	1.37	7.01	.007
Sleep	Sleep quality index	2.26	1.12	4.54	.022
	Impaired awakenings	1.23	0.66	2.28	.516
	Sleepiness	2.41	0.92	6.32	.073
	Too little sleep < 6h	3.51	1.76	6.98	.000
Physical and psychological symptoms	Pain symptoms	1.42	0.76	2.65	.271
	Heart symptoms	1.80	0.96	3.35	.066
	Stomach symptoms	1.33	0.82	2.17	.244
	Persistent fatigue	1.51	0.85	2.69	.164
	HAD-Depression	1.17	0.99	1.39	.059
	HAD-Anxiety	1.15	0.98	1.35	.093
	SMBQ - Total score	3.93	1.45	10.62	.007

Note. ExpB = Exponent beta; CI = Confidence interval; HADS = Hospital Anxiety and Depression Scale; SMBQ = Shirom-Melamed Burnout Questionnaire.

cluded from the multivariate approach. All analyses were performed with SPSS version 19.0 for Mac OSX.

**Results**

**Univariate Regressions**

Results from the univariate logistic regression analyses are shown in Table 1. None of the demographic background variables (gender, age, having children younger than seven years of age, or being single) significantly predicted the criterion (“burnout case”). Among the work related factors tested, significant results were shown for “work demands.” Notably, neither “decision latitude” nor the support indices significantly predicted future burnout. Among the sustained-activation factors tested, “thoughts of work during leisure time” became a significant predictor. Among the sleep related factors, the “sleep quality” index and

“too little sleep” significantly predicted the criterion. Regarding physical health symptoms, none of the tested factors (pain, heart, and stomach symptoms) significantly predicted the criterion. The total SMBQ score at baseline became a significant predictor of subsequent clinical burnout. Anxiety and depression scores from HADS did not reach statistical significance.

**Bivariate Correlations**

Bivariate correlation coefficients (Pearson’s *r*) for all significant variables from the univariate analyses are presented in Table 2 below. The sample was quite large (*n* ranged from 374–388), and all associations showed positive statistical significance. Notably, “work demands” showed high significant positive association with “thoughts of work during leisure time” as well as with the sleep factors. SMBQ scores correlated positively with all factors.

Table 2  
Correlation Matrix Showing Binary Correlation Coefficients (Pearsons R) for All Significant Independent Variables From the Univariate Logistic Regression Analyses

	Work demands	Thoughts of work	Sleep quality	Too little sleep (<6 hrs)	SMBQ total score
Work demands	1				
Thoughts of work	.400**	1			
Sleep quality	.195**	.385**	1		
Too little sleep (<6 hrs)	.201**	.155**	.381**	1	
SMBQ total score	.353**	.387**	.460**	.358**	1

Note. SMBQ = Shirom-Melamed Burnout Questionnaire.  
\*\* Correlation is significant at the 0.01 level (two-tailed).

Table 3  
*Hierarchical Logistic Regression With Burnout Case as Dependent Variable and the Independent Variables Entered Stepwise*

Variables in the equation	B	Wald	<i>p</i>	ExpB	CI		Sig.			Nagelkerke
					Lower	Upper	Step	Block	Model	R2
Step 1										
Work demands	1.28	5.56	.018	3.59	1.24	10.39	.015	.015	.015	.057
Constant	-6.47	19.37	.000	0.00	, =	, =	, =	, =	, =	, =
Step 2										
Work demands	0.79	1.85	.174	2.21	0.70	6.97	.038	.038	.006	.097
Thoughts of work	0.89	3.95	.047	2.44	1.01	5.89	, =	, =	, =	, =
Constant	-7.65	21.66	.000	0.00	, =	, =	, =	, =	, =	, =
Step 3										
Work demands	0.58	1.04	.307	1.79	0.59	5.45	.037	.037	.002	.159
Thoughts of work	0.88	3.16	.075	2.40	0.91	6.31	, =	, =	, =	, =
Too little sleep	1.05	6.39	.011	2.86	1.27	6.47	, =	, =	, =	, =
Sleep quality	-0.08	0.04	.847	0.92	0.40	2.14	, =	, =	, =	, =
Constant	-9.72	24.26	.000	.000	, =	, =	, =	, =	, =	, =

Note. ExpB = Exponent beta; CI = Confidence interval.

## Multivariate Regressions

To analyze the combined contribution from the most important independent factors, a multiple logistic regression analysis was carried out (see Table 3). As the number of cases was small, it was of importance to include only a small number of independent variables in the multivariate analysis. It was hypothesized that high work demands may lead to impaired recovery during leisure time (i.e., sustained activation), and to sleep disturbance, which all may represent important risk factors in the burnout process. Therefore, variables with a significant predictive value in the univariate regression analyses, representing the areas “work stress,” “sustained activation,” and “sleep,” were tested in a multiple hierarchical logistic regression analysis. This yielded four variables that were entered into the analysis (enter stepwise): “work demands,” “thoughts of work during leisure time,” “too little sleep (less than 6 hours per night)” and “sleep quality.”

In the first step, “work demands” was entered. The result showed a significant effect of the block and of the model. “Work demands” significantly predicted clinical burnout, and the explained variance at this step was 5.7%. In the second step, “thoughts of work during leisure time” was entered. This yielded a significant effect of the block and of the model. Controlling for the effect of “work demands,” “thoughts of work during leisure time” became a significant predictor in this second step, but “work demands” did not remain significant. The explained variance of the model increased at this step to 9.7%. In the third and final step of the analysis, the two sleep factors “too little sleep (less than 6 hours per night)” and “sleep quality” were entered. This yielded a significant effect of the block and of the complete model, in which “too little sleep” became the only significant predictor. The explained variance of the complete model was 15.9%. When entered as an additional control in a fourth step, burnout scores did not become a significant predictor and the results of the complete model did not change (Step  $p = .968$ ; Block  $p = .968$ , Model  $p = .006$ ; Nagelkerke  $R^2 = .158$ , SMBQ Exp(B) = 1.03; CI = 0.27–3.86).

## Discussion

The results of the hierarchical stepwise multiple logistic regression analysis identified “too little sleep (less than 6 hours)” as the main risk factor for clinical burnout, after adjustments for “work demands,” “thoughts of work during leisure time,” and “sleep quality.” The first two factors were both significant predictors in earlier steps of the multivariate regression.

To the best of our knowledge, the present study is the first prospective study of clinical burnout, and thus comparable data are lacking. Two recent studies have explored the relationship between insomnia and self-reported burnout in prospective designs, but with inconclusive results. Armon et al. (2008) found that insomnia and burnout mutually predicted each other. However, Jansson-Fröjmark & Lindblom (2010) did not find any bidirectional relationship between burnout and insomnia. Instead they showed that insomnia predicted future burnout, but burnout did not predict future insomnia. Both these studies were not focusing on clinical burnout but used self-rated scores on the Shirom-Melamed Burnout Questionnaire to select burnout cases. Our study focused on clinical burnout, and the results agree with the previous observations found in cross-sectional studies, in which sleep disturbance and work stress has been closely related to burnout (Melamed et al., 1999; Grossi et al., 2003). In another paper, in which sleep physiology was measured, burnout subjects on long-term sick-leave showed more fragmented sleep, lower sleep efficiency, longer sleep latency, and less stage 3 and 4 sleep than comparable controls (Ekstedt et al., 2006). In a group of working employees scoring high on burnout, sleep physiology showed increased fragmentation (Söderström et al., 2004). Some studies have sought to explore the role of sleep in the process of burnout development and improvement. A qualitative study of burnout patients indicated that work-induced sleep disturbance was a precipitating factor for clinical burnout (Ekstedt & Fagerberg, 2005). Sonnenschein et al. (2008) showed that burnout patients with impaired sleep at baseline showed higher levels of exhaustion at follow-up (6 months) and that trouble falling asleep and less refreshing sleep

at baseline hampered eventual full work resumption. Further, Ekstedt et al. (2009) showed that reduced fatigue over time was the best predictor of return to work in burnout patients. In turn, reduced fatigue was predicted by improved sleep continuity. These observations, together with the fatigue inducing effects of sleep loss and sleep disturbance (Bonnet, 1985; Bonnet, 1986; Van Dongen et al., 2003), suggest that sleep plays an important role both in precipitating clinical burnout and in the process of symptom improvement and returning to work. The results from the present study, which should be interpreted with caution because of the small sample size, indicate that self-reported short sleep (less than 6 hours per night), is a stronger risk factor at early stages of the burnout development, than are self-reported sleep quality, as the latter did not become a significant predictor in the multiple approach, but “too little sleep (<6 hours)” did. The causal chain remains to be demonstrated conclusively, however.

The early steps of the multiple regression analysis suggest that high work demands and “thoughts of work during leisure time” also predict burnout. Both seem logical because burnout by definition involves long term stress exposure (Melamed et al., 2006; Socialstyrelsen, 2005), and the inability to disengage from thoughts of work during leisure time is closely related to disturbed sleep (Fahlén et al., 2006; Åkerstedt et al., 2002) as is rumination in general (Harvey, 2002). Recent studies have shown that perseverative cognition is related to increased activity of the autonomic nervous system, and that the physiological activation may continue for several hours after that conscious perseverative cognition has stopped, and even during sleep (Brosschot, 2010; Hall et al., 2007). Overcommitment, the six-item short form of the intrinsic-effort scale of the effort-reward model, has also been shown to predict vital exhaustion (Preckel, von Kanel, Kudielka, & Fischer, 2005), which is closely related to burnout. Taken together, the regression analyses suggest a chain of causation for burnout development that involves stress, preoccupation of thoughts of work (sustained cognitive activation), and sleep disturbance, although the causation throughout the chain remains to be demonstrated.

Burnout scores measured by SMBQ at baseline significantly predicted subsequent clinical burnout in the univariate logistic regression analysis. This suggests that SMBQ is a valid predictive measure for future clinical burnout development. Notably, however, when burnout score was entered at a fourth step in the multiple logistic regression approach, it did not add any explained variance to the model and did not become a significant predictor in the model. The latter indicates that, at early stages of burnout development, measures of work demands, sustained cognitive activation, and insufficient sleep taken together have as strong, or stronger, predictive power as the SMBQ. As was shown in the results of the bivariate correlation analyses, burnout scores at baseline were highly intercorrelated with all the factors mentioned, and one should be aware of the fact that there is always a possibility that chance affected the results.

Among the limitations of this article is its modest number of cases. With respect to this, we suggest that the present study should be seen as a pilot for further attempts to determine the precipitating factors of burnout. However, the study had a prospective field-study approach and the number of participants was dependent on the number of individuals who during the project time developed clinically impairing burnout symptoms leading to

a referral for treatment. Thus, the number of cases included in the study was not possible to know beforehand, nor was it possible to affect or to increase. Naturally, the time between the baseline measurement and the clinical assessment and referral to treatment varied between the subjects, as this was a clinical field study. Therefore, no comparisons of data over time were made between the time of the initial questionnaire and the time of referral to treatment.

As a consequence of the small number of cases, the possible number of variables to be tested in the multiple regression analysis had to be kept low. On the other hand, when trying to test a hypothesis or the predictive value of certain variables in relation to each other, a small number of independent factors can be preferred (even if dealing with larger sample sets) to be able to make more appropriate interpretations of the results. In the present study, the included variables were chosen to test whether work stress and/or impaired recovery predicted burnout, and therefore only the significant variables from each of the blocks “work demands,” “sustained activation,” and “sleep” were included. Notably, neither the demographic variables, nor anxiety, depression, or other health complaints, significantly predicted clinical burnout in the univariate regression analyses, why these variables were not included in the multiple approach. One also needs to consider whether other predictors should have been included, like physical workload or general health.

This study focused on clinical burnout, that is, subjects were included into the study on the grounds that they were experiencing stress or fatigue symptoms which significantly reduced work capacity or quality of life. This is one of this study’s strengths, as predictive studies on clinical burnout is lacking. The subjects were all assessed by a trained clinical psychologist for evaluation of possible inclusion in the present study as “burnout-cases” (inclusion criteria presented in the Methods section above). All clinical records were examined retrospectively at the end of the project, by the psychologist who did the assessment and by a senior clinician, who was a member of the group setting the national diagnostic criteria for burnout, to secure that included cases met the inclusion criteria. However, despite these control procedures, there is always a possibility that potential cases may have been missed, or that an unknown number of individuals within the reference group may suffer from “subclinical” burnout, which may have underestimated the predictive power of the independent variables. In further research, studies with a prospective case-control design would be of great value. The approach used in this study has its weaknesses, but on the other hand, compared with a case-control approach, it might give a result that mirrors a more natural scenario as it is not comparing extreme groups (high and low burnout scores).

Regarding the SMBQ-data presented in this article, these are all from the baseline measurement, as we aimed to test the predictive value of SMBQ for future clinical burnout. Systematic comparisons of self-reported burnout (using the SMBQ or the MBI) with clinical assessment of burnout is lacking in the literature and would be of importance to investigate in future research. There are, however, studies of burnout patients showing high values on the SMBQ, for example the article by Ekstedt and colleagues (2009), in which SMBQ mean scores for the patient group was  $5.7 \pm 0.2$  (seven-point graded) and  $1.7 \pm 0.2$  for the healthy controls, indicating a high discriminate value of the measure.

For future research it would also be of great interest to analyze predictive factors for burnout groups with different amount of sick leave. In our sample, two groups could be identified; one that continued working throughout the treatment period and one that was on sick leave for four weeks or more. We tested the multiple model on these two groups, although neither analysis became significant. The fact that these analyses failed to reach statistical significance can be attributable to low statistical power.

In conclusion, the results of the present study suggest that insufficient sleep and sustained cognitive activation, as difficulties detaching from thoughts of work during leisure time, are stronger predictors of clinical burnout than stressful work demands. This points to the very important role of *recovery from stress*—not stress per se—in the process of burnout development, and, in more general terms, for maintaining good health and wellbeing. That is, stress may not be harmful as long as adequate recovery has taken place. When recovery gets impaired, however, the situation will become more severe and the risk for negative health consequences significantly increases. Interventions to enhance sleep and recovery in occupational settings could help prevent burnout.

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