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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 third 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.

Keywords: Burnout; Cortisol; Exhaustion; Experience sampling method; Electronic diary; DHEAS

1. 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. 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

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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,b).

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 and Nicolson, 1994; Van Eck et al., 1996a,b; Smyth et al., 1998; Adam, 2006). 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-subject relationships may be found irrespective of between-subject relationships. Therefore negative results of between-subject 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