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Construction and evaluation of a self rating scale for stress-induced Exhaustion Disorder, the Karolinska Exhaustion Disorder Scale

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Prolonged stress (≥ six months) may cause a condition which has been named exhaustion disorder (ED) with ICD-10 code F43.8. ED is characterised by exhaustion, cognitive problems, poor sleep and reduced tolerance to further stress. ED can cause long term disability and depressive symptoms may develop. The aim was to construct and evaluate a self-rating scale, the Karolinska Exhaustion Disorder Scale (KEDS), for the assessment of ED symptoms. A second aim was to examine the relationship between self-rated symptoms of ED, depression, and anxiety using KEDS and the Hospital Anxiety and Depression Scale (HAD). Items were selected based on their correspondence to criteria for ED as formulated by the Swedish National Board of Health and Welfare (NBHW), with seven response alternatives in a Likert-format. Self-ratings performed by 317 clinically assessed participants were used to analyse the scale's psychometric properties. KEDS consists of nine items with a scale range of 0–54. Receiver operating characteristics analysis demonstrated that a cut-off score of 19 was accompanied by high sensitivity and specificity (each above 95%) in the discrimination between healthy subjects and patients with ED. Reliability was satisfactory and confirmatory factor analysis revealed that ED, depression and anxiety are best regarded as different phenomena. KEDS may be a useful tool in the assessment of symptoms of Exhaustion Disorder in clinical as well as research settings. There is evidence that the symptom clusters of ED, anxiety and depression, respectively, reflect three different underlying dimensions.

Key words: Stress, cognitive problems, exhaustion disorder, KEDS, screening, burnout.

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INTRODUCTION

Psychiatric illness has become a major cause for long-term sick leave (Järvisalo *et al.*, 2005). In Sweden, the leading category of psychiatric conditions that may call for sick leave is *Reaction to severe stress*, *and adjustment disorders* (F43 in the ICD-10 classification), with depressive disorders as the second most common category (Swedish Social Insurance Agency, 2010). Among the reactions to stress is the condition caused by chronic, unrelenting, but not life threatening stress. This condition is characterized by prolonged fatigue, sleep disorder, cognitive problems and an increased sensitivity to further stress, which may lead to anxiety reactions.

In spite of the typical clinical picture, chronic stress disorder is not yet recognized in any of the major psychiatric classification systems. Because the relevant stress is often occupational, it has sometimes been referred to as "burnout" or "chronic/clinical burnout syndrome," (Ekstedt, Söderström & Åkerstedt, 2009; Grossi, Perski, Ekstedt, Johansson, Lindström & Holm, 2005; Sandström, Rhodin, Lundberg, Olsson & Nyberg, 2005). Professional burnout as described Freudenberger (1974), Maslach (1982) and Schaufeli and Enzmann (1998) is, however, a much broader psychological concept characterized by emotional exhaustion, cynicism and reduced professional accomplishment. Thus, the ICD-10 recognizes burnout among *Problems related to life management difficulty* (Z73.0), but not as a medical condition. The Swedish National Board of Health and Welfare (NBHW) have provided tentative diagnostic criteria (Table 1) for chronic stress, and suggest that the term exhaustion disorder (ED) and the ICD code F43.8 should be used. Using this diagnostic concept, Saboonchi, Perski and Grossi (2012) found that most of the variance in ED could not be explained by burnout, as assessed with the Shirom Melamed Burnout Questionnaire (Melamed, Kuschnir & Shirom, 1992).

ED-symptoms overlap with those of many other psychiatric disorders, particularly depression, and there is an on-going discussion whether clinical burnout, ED and other prolonged fatigue states should be included among the affective disorders, and best diagnosed as cases of depression or anxiety, rather than classified as diseases in their own right (Cho, Skowera, Cleare & Wessely, 2006; Glass & McKnight, 1996). Although many ED patients fulfill diagnostic criteria for depression at some stage of their illness, the low mood is often temporary while the core symptoms of ED (exhaustion, cognitive problems, sleep disturbance) remain. Perski and Grossi (2004) suggested that a depressive state might be a consequence or a complication of stress-related emotional exhaustion, rather than the core problem.

The decision of the NBHW to recommend that ED be used as a diagnostic classification was based almost entirely on clinical experience, which suggested that the prolonged course of the condition and the poor effect of standard antidepressant treatment (Bryngelson, Mittendorfer-Rutz, Jensen, Lundberg, Åsberg & Nygren, 2012) differentiated ED from major depressive disorder. Recent research suggests that the genetic background (Gizatullin, Zaboli, Jonsson, Åsberg & Leopardi, 2008; Zaboli *et al.*, 2008), the hypothalamus-pituitary-adrenal (HPA) axis reactivity (Rydmark, Wahlberg, Ghatan *et al.*, 2006; Wahlberg, Ghatan, Modell *et al.*, 2009), the increased blood concentrations

Table 1. *Criteria for Exhaustion Disorder according to the National Board of Health and Welfare in Sweden*

A. Physical and mental symptoms of exhaustion during at least two weeks. The symptoms have developed in response to one or more identifiable stressors present for at least six months.
B. The clinical picture is dominated by markedly reduced mental energy, as manifested by reduced initiative, lack of endurance, or increased time needed for recovery after mental effort.
C. At least four of the following symptoms have been present, nearly every day, during the same 2-week period:
  1/ Concentration difficulties or impaired memory
  2/ Markedly reduced capacity to tolerate demands or to work under time pressure
  3/ Emotional instability or irritability
  4/ Sleep disturbance
  5/ Marked fatigability or physical weakness
  6/ Physical symptoms such as aches and pains, palpitations, gastrointestinal problems, vertigo or increased sensitivity to sound
D. The symptoms cause clinically significant distress or impairment in occupational, social or other important respects.
E. The symptoms are not due to the direct physiological effects of a substance (e.g., a drug of abuse, a medication) or a physical illness/injury (e.g., hypothyroidism, diabetes, infectious disease).

of cellular growth factors such as VEGF and EGF (Åsberg, Nygren, Leopardi, Rylander, Peterson & Wilczek, 2009) and possibly also the neurobiological concomitants (Jovanovic, Perski, Berglund & Savic, 2011; Blix, Perski Berglund & Savic, 2013) may differentiate the two conditions.

In order to test possible differences in course, as well as treatment outcome of ED and depression, respectively, sensitive rating scales are needed. Chronic stress symptoms are presumably not rare in the general population, and a rating scale might aid in the differentiation between normal tiredness and exhaustion disorder. Measures of burnout such as the Maslach Burnout Inventory (Maslach & Jackson, 1986) are strongly focused on work and are not easily applicable to patients who are on long-term sick leave or out of work. The same objection applies to work focused fatigue scales such as the Occupational Fatigue Exhaustion/Recovery Scale (OFER; Winwood, Winefield, Dawson & Lushington, 2005) and the Swedish Occupational Fatigue Inventory (SOFI; Åhsberg, Gamberale & Kjellberg, 1997). A few rating scales for exhaustion disorder or clinical burnout have been created (Glise, Hadzibajramovic, Jonsdottir & Ahlborg, 2009; Saboonchi *et al.*, 2012), but validated cut-off scores between cases and normal conditions have not yet been presented.

The aim of the present study was to construct and evaluate the psychometric properties of a self-rating scale for assessment of ED symptoms, with focus on the scale's ability to differentiate between individuals with and without ED. Secondarily; we aimed to investigate the relationship between self-assessed symptoms of ED and depression, and between ED and anxiety, to evaluate the construct validity of the new ED scale.

METHODS

Construction of the scale

The construct to be measured was defined by the criteria for ED, formulated by the NBHW in 2003 (Table 1). Items in KEDS were chosen on the basis of their correspondence to ED criteria A–C. Six items were

selected from the Comprehensive Psychopathological Rating Scale (CPRS; Åsberg, Montgomery, Perris, Schalling & Sedvall, 1978), namely, CPRS items 4, 5, 15, 16, 17 and 19. Another four items were formulated on the basis of symptoms often reported by ED patients. The 10 items in the initial version of KEDS were: (1) ability to concentrate, (2) memory, (3) physical stamina, (4) mental stamina, (5) recovery, (6) sleep, (7) sensory impressions, (8) emotional engagement, (9) experience of demands, and (10) irritation and anger. The CPRS items were rephrased where appropriate, to fit with the vocabulary and definitions found in autobiographical reports or descriptions made by patients suffering from ED. One example is the "stamina" items, which were originally a single item. As patients have pointed out that "stamina" could refer to mental as well as to physical phenomena, these distinctions were made clear by formulating two separate items. Each KEDS item had seven unipolar response alternatives ranging from 0-6, with higher values reflecting more severe symptoms. Definitions were formulated at score 0, 2, 4 and 6 but not at 1, 3 and 5 (see Appendix).

A panel of psychiatrists, experienced psychotherapists and ED-patients (altogether 15 individuals), agreed that items and terminology were relevant except for item 8 (emotional engagement). This item was excluded as it reflects one of the two main DSM criteria of depression but is not particularly typical of ED. Hence, the final version of the scale consists of nine items (see Appendix).

KEDS was originally formulated in Swedish, translated into English by a native American professional translator and back translated into Swedish by a bilingual Swedish psychologist. The similarity of these two Swedish versions was judged to be satisfactory by the constructors of the scale. Subsequent testing was performed with the original Swedish version. A French version has been produced in the same way and a Dutch translation is on-going. (For information about these versions, please contact the authors.)

Participants

KEDS was evaluated using ratings from 203 patients diagnosed with ED and 117 healthy control subjects. All participants gave their informed consent to the study. The patients were 34 sick-listed individuals who were recruited to an intervention study at the Karolinska Institute during 2005–2006, and 169 patients who were referred to a stress rehabilitation clinic by their general practitioners during 2008–2010. All patients fulfilled the criteria for ED (Table 1), either with or without symptoms of depression and/or anxiety, as examined by a psychiatrist or a rehabilitation physician and psychologist. Three patients' ratings were incomplete and were excluded, thus 200 patients were included in the analysis.

The 117 comparison individuals were randomly selected during 2009 and 2010 from the population in the County of Stockholm, by Statistics Sweden (SCB). The aim was to obtain a similar age distribution as that of clinical ED patients but with a slight over representation of men compared to typical ED since the group was also meant to be used as controls for a subsequent study of heart disease. All controls were in good physical and mental health as assessed by a psychiatrist (MÅ) or a trained physician (ÅN), using a clinical interview schedule (M.I.N.I.; Sheehan, Lecrubier Sheehan *et al.*, 1998; Allgulander, Wærn, Humble, Andersch & Ågren, 2009). None of the controls met DSM-IV criteria for a history or current psychiatric disorder, personality disorder or severe somatic illness. The controls were 25–55 years old and worked full- or part-time.

Measures

KEDS was distributed prior to treatment (patients), or on study inclusion (controls). On the same occasion, all subjects rated themselves on the Hospital Anxiety and Depression scale (HAD). The HAD was developed for assessing clinically significant degrees of anxiety (HAD-A) and depression (HAD-D) (Zigmond & Snaith, 1983). A review of 71 articles, including somatic, psychiatric and primary care patients and the general population samples, found that both HAD-subscales performed well in assessing symptom severity (Bjelland, Dahl, Haug & Neckelmann,

2002). For both HAD scales, a score of 8–10 is defined as doubtful caseness, while 11 or more is defined as definite caseness (Zigmond & Snaith, 1983). The HAD consists of 14 items, seven reflecting anxiety and seven for depression. The items regarding the anxiety scale are the uneven numbers and depression are the even numbers. In our patient group Cronbach's alpha was 0.78 for HAD-D and 0.82 for HAD-A, and 0.74 and 0.76, respectively, in the healthy control group.

Statistical analyses

Descriptive characteristics were compared between patients and controls using independent sample T-test for age, and chi-square (or the Fisher exact test when the expected count was less than 5) for gender proportions and educational level.

KEDS ratings were analysed at item-level and for summated scores. According to Curran, Finch & West (1996) the assumption of normal distribution is severely violated if skewness > 2 and kurtosis > 7.

The differences in KEDS scores at item- and total sum-level between groups and genders were examined using non-parametric independent-sample median test. The diagnostic validity was also assessed by analyses of summated scores using receiver operating characteristics (ROC) curve, using clinically evaluated exhaustion disorder as gold standard. Principal Component Analysis (PCA) with varimax rotation was used in order to explore dimensionality of KEDS. Internal consistency was evaluated by the Cronbach's alpha coefficient.

Confirmatory Factor Analyses (CFA) with Full Information Maximum Likelihood estimation (FIML) was conducted using Amos 21 software (IBM, Chicago, IL). Besides χ^2, model fit was assessed with the Bentler-Bonnett Normed Fit Index (NFI), the Comparative Fit Index (CFI), and the Root-Mean-Square Error of Approximation (RMSEA). According to Hu and Bentler (1999), a NFI and CFI value above 0.95, and a RMSEA value below 0.05, indicate close fit. The following models were assessed: (1) All three latent variables – ED, anxiety, and depression – were collapsed to one latent variable; (2) ED and anxiety were collapsed to one latent variable while depression was treated as a separate latent variable; (3) ED and depression were collapsed and anxiety was treated as separate; (4) Anxiety and depression were collapsed and ED was treated as separate; and (5) All three latent variables were treated as separate. These five models were assessed either using the full sample (A1–A5) or only the patients (P1–P5). The significance of the difference in fit between some nested models was tested by subtracting their χ^2-values ($\Delta\chi^2$). In order not to violate assumptions of normality, parameter values were calculated in 5,000 bootstrap samples. As bootstrapping in Amos cannot be conducted with missing data, these (not more than 3 on any item) were replaced through linear interpolation.

Ethics

The studies were approved by the Ethics committee at the Karolinska Institute.

RESULTS

Descriptive characteristics

Descriptive characteristics are presented in Table 2. Neither age nor educational level differed significantly between groups. As planned the proportion of men was higher in the control group than in the patients.

Explorative factor analysis and reliability

An explorative factor analysis of KEDS in the full sample revealed one factor with eigenvalue > 1 (6.11, explaining 67.87% of the total variance in the nine items) indicating

Table 2. *Characteristic of patients and controls at the time of inclusion. Proportions of doubtful and definite cases of HAD-A and HAD-D, according to the cut-off values suggested by Zigmond & Snaith (1983)*

	Patients, n = 200	Controls, n = 117	p for difference
Age years – Mean (s.d.)	45.4 (8.6)	45.2 (7.0)	0.836
Range years	25 - 64	25 - 55	-
Women, n (%)	176 (88.0)	79 (67.5)	0.050
Educational level:			
Compulsory school, n (%)	9 (4.5)	6 (5.1)	0.804
Upper secondary school, n (%)	62 (31.0)	36 (30.8)	0.972
University, n (%)	127 (63.5)	75 (64.1)	0.948
Data not available, n (%)	2 (1.0)	-	-
Sick-leave at inclusion:	n = 197	n = 117	
Full-time, n (%)	132 (67.0)	-	-
Sick leave 25 – 75%, n (%)	63 (32.0)	-	-
Sick leave 0%, n (%)	2 (1.0)	117 (100.0)	< 0.001
HAD, subscale Anxiety	n = 194	n = 117	
Individuals scoring ≥ 8 and ≤ 10, n (%)	50 (25.8)	5 (4.3)	< 0.001
Individuals scoring ≥ 11, n (%)	105 (54.1)	2 (1.7)	< 0.001
HAD, subscale Depression	n = 194	n = 117	
Individuals scoring ≥ 8 and ≤ 10, n (%)	69 (35.6)	5 (4.3)	< 0.001
Individuals scoring ≥ 11, n (%)	89 (45.9)	0 (0.0)	< 0.001

unidimensionality of the scale. The factor loadings varied between 0.66 (item 9, irritation and anger) and 0.92 (item 4, mental stamina).

Separate analyses for the patients and the controls yielded two factors with eigenvalues > 1 in each subsample. The factor structure, after varimax rotation, was, however, not consistent in the two subsamples, and a decision was taken to regard KEDS as a unidimensional scale (data available on request). This decision was supported by scree plots. Internal consistency was acceptable with Cronbach's alpha of 0.94 in the full sample, 0.74 in patients, and 0.81 in controls.

Diagnostic validity

Each item-score was increased in patients ($p < 0.01$), indicating that no item was irrelevant.

The distributions of KEDS summated scores across groups are presented in Fig. 1. Summated scores in the patient group formed a bell-shaped distribution. A majority of the ratings performed by healthy individuals, gathered at very low scores forming a positively skewed distribution.

ROC coordinates are shown in Table 3. The discriminative ability of KEDS was very good as demonstrated by the $AU_{ROC}C$ (> 0.99, $p < 0.01$, 95% CI 0.982; 1.000), indicating that an individual with ED would reach higher scores than a person without ED, with a likelihood of approximately 99%. A cut-off score of 18.5 (in clinical practice rounded to 19) was considered appropriate with both sensitivity and specificity above 95%.

Although Table 3 suggests that KEDS might have both higher sensitivity and higher specificity among women compared with men, separate analyses revealed that the discriminative ability was high in both genders ($AU_{ROC}C$ for women = 0.99; $p < 0.001$; $AU_{ROC}C$ for men = 0.98; $p < 0.001$).
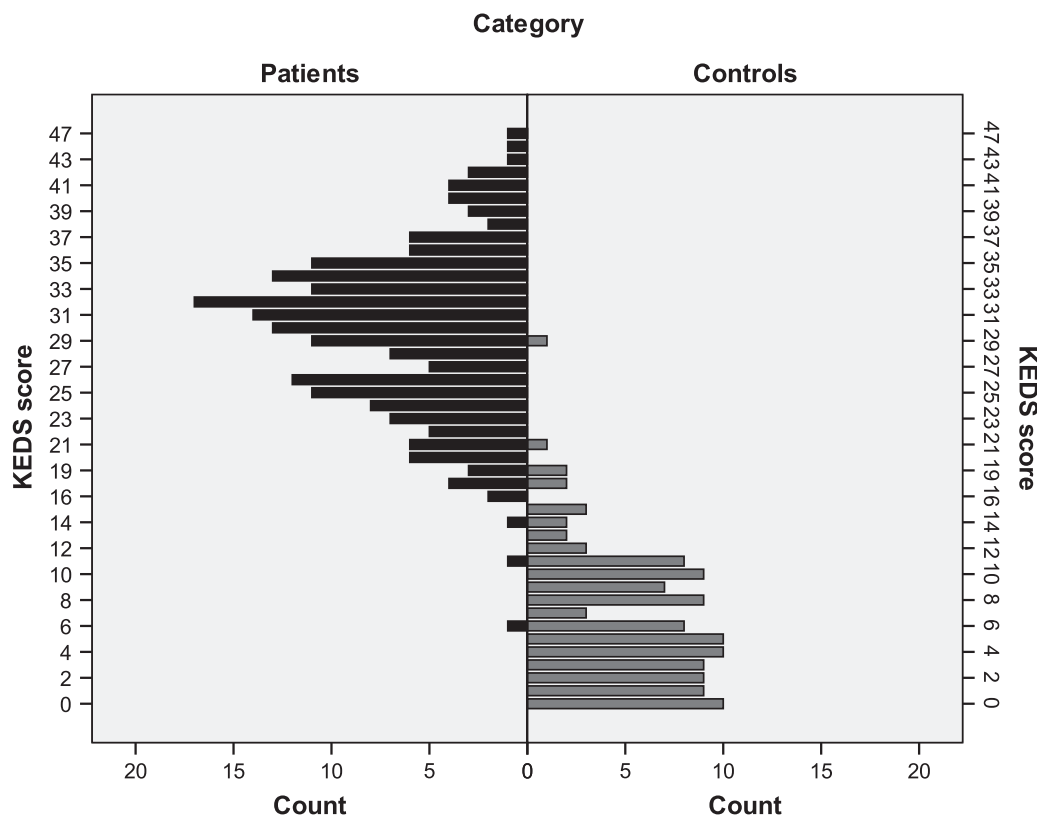
Category

Fig. 1. Distribution of summated scores as assessed by the KEDS-scale in ED-patients (n=200) and in controls (n=117).

Table 3. *ROC-Coordinates showing scores with the best balance between sensitivity and specificity for the discrimination between ED patients and healthy controls on the KEDS and HAD subscales.*

KEDS			HAD-D			HAD-A		
Scores	Sensitivity	Specificity	Scores	Sensitivity	Specificity	Scores	Sensitivity	Specificity
All								
17.0	97.5	94.9	4.5	95.9	82.9	5.5	90.2	86.3
18.5	95.5	96.6	5.5	92.3	88.0	6.5	85.1	89.8
19.5	94.0	98.3	6.5	86.6	94.9	7.5	79.9	94.0
Women								
17.0	98.3	97.5	4.5	97.2	84.8	5.5	90.3	86.1
18.5	96.0	97.5	5.5	93.2	89.9	6.5	84.7	91.1
19.5	94.3	98.7	6.5	86.9	97.5	7.5	80.1	94.9
Men								
17.0	91.7	89.5	4.5	87.5	78.9	5.5	91.7	86.8
18.5	91.7	94.7	5.5	83.3	84.2	6.5	87.5	86.8
19.5	91.7	94.7	6.5	83.3	89.5	7.5	79.2	92.1

Note: In both HAD subscales, non-caseness is defined by 0-7 according to Zigmond & Snaith (1983).

Binary logistic regression analyses confirmed that KEDS scores have a positive association with the odds of being a patient both among women (the odds of being a patient increases with 70.1% for every increase in KEDS with one point, $p < 0.001$) and among men (an increase in the odds with 38.8% for every increase in KEDS with one point, $p < 0.001$). Gender was not a significant moderator of the associations between KEDS scores and the odds to be a patient ($p = 0.114$).

ROC analyses using both HAD scales (Table 3), demonstrated that the best balanced sensitivity and specificity occurred on scores well below the threshold defining caseness suggested by

Zigmond and Snaith (1983). In both HAD subscales, caseness is defined by a score of 10 and above.

Construct validity

Model fit for the five models analyzed in the CFA are presented in Table 4, separately for the full sample ($N = 317$) and for patients only ($N = 200$). The model fit was significantly better for the model with three separate latent variables, both for the full sample (A5 vs. A3, which has the second best fit, $\Delta\chi^2 = 158$, $df = 2$, $p < 0.001$), and for patients only (P5 vs. P3, $\Delta\chi^2 = 85$,

Table 4. *Model Fit for the Models with One to Three Latent Variables, Calculated on the Full Sample (A1-A5) or Only the Patients (P1-P5).*

Model	Collapsed	Not Collapsed	χ^2	Df	NFI	CFI	RMSEA
A1	Allthree	None	978	230	0.838	0.871	0.101
A2	ED and Anxiety	Depression	836	229	0.862	0.895	0.092
A3	ED and Depression	Anxiety	759	229	0.875	0.908	0.086
A4	Anxiety and Depression	ED	808	229	0.867	0.900	0.089
A5	None	Allthree	601	227	0.901	0.935	0.072
P1	Allthree	None	732	230	0.545	0.623	0.105
P2	ED and Anxiety	Depression	642	229	0.601	0.690	0.095
P3	ED and Depression	Anxiety	553	229	0.657	0.757	0.084
P4	Anxiety and Depression	ED	640	229	0.603	0.692	0.095
P5	None	Allthree	468	227	0.710	0.820	0.073

$df = 2$, $p < 0.001$). Both for the full sample and for the patients, the model where all three latent variables are collapsed to 1 had the poorest fit. The fit of the model with three separate latent variables could be characterized as acceptable when using the full sample but not when using only the patients.

The parameter values, calculated through bootstrapping, for the model with three separate latent variables, are presented in Fig. 2. It can be noted that all values are higher when using the full sample than when using only the patients. When using only the patients, a few loadings are quite low, especially those for KEDS 6 (sleep) and KEDS 9 (irritation and anger).

DISCUSSION

A nine item summated self-rating scale, the Karolinska Exhaustion Disorder Scale (KEDS), for assessment of symptoms of stress-induced exhaustion disorder (ED, also known as chronic stress disorder, or clinical or severe burnout), was developed and evaluated. The scale was unidimensional and internally consistent, and discriminated between ED patients and healthy controls with a specificity and sensitivity exceeding 95% at a cut-off score of 19 (total range 0–54).Confirmatory factor analysis supports the idea of ED as a separate disorder, albeit there are associations between KEDS and measures of depression and anxiety.

Respondent feedback indicated that the scale was easy to use, and may improve patient understanding of ED symptomatology. The symptoms of other prolonged fatigue states, for instance the chronic fatigue syndrome, as well as neurasthenia (Hickie, Hadzi-Pavlovic & Ricci, 1997), are quite similar to exhaustion disorder, and it is possible that KEDS could be useful for research in these conditions as well, although this remains to be shown. Whether these syndromes are actually identical or overlapping conditions is outside the scope of the present study, but an interesting research question.

Our study shows that ED, depression- and anxiety-related conditions have an amount of shared variance in patients currently suffering from ED. Forty six percent of our patients with ED could also be classified as definite cases of depression on the HAD-D using the established caseness definition (Zigmond & Snaith, 1983), but the optimal HAD-D cut off scores between patients and controls in the ROC analyses lay well below the caseness definition.

The confirmatory factor analyses further strengthened the conclusion that ED, depression, and anxiety are distinct conditions.

When using data from patients only, model fit and parameter values decreased compared to the full sample (Table 3, Figure 2). This could be due to a bimodal distribution on the manifest variables in the full sample, which would tend to inflate the strength of observed associations, although the bootstrapping method we used is not based on assumptions of normality. However, although the model fit was mediocre in the group of patients, it was still significantly better when ED, depression and anxiety were defined as three separate constructs.

Most items performed well in the confirmatory factor analyses, but two of them – sleep, and irritation and anger, loaded weakly on the latent variable (ED) in the patient group. A possible explanation may be that ED patients can have different types of sleep disorders. While the most common disturbance is difficulties falling asleep and restless, brief sleep, some may have very long duration of sleep and still wake up feeling unrested. The sleep item in KEDS reflects the first type of sleep disorders. Irritation and anger is, according to clinical experience, a characteristic feature of the early phases in ED and often disappears with increasing duration of the disorder. Taken together, these items contribute to the distinction between pathological exhaustion and normal tiredness, but may not reflect severity of ED. The formulations of response alternatives to both items will be slightly revised in further editions of the scale.

Sick listed patients treated for depression with drugs or psychotherapy quite often experience difficulties returning to work, even after their depressive symptoms are relieved (Adler, Adler, McLaughlin *et al*., 2006; Bryngelson *et al*., 2012). We suggest that exhaustion symptoms, which may have a longer duration than depressive symptoms, may partly account for this and that KEDS might yield useful information in such cases. Together with validated scales for assessment of depression and anxiety, KEDS could be used in clinical trials and possibly explain the absence of desirable effects of antidepressant medication in some cases.

Another possible use for KEDS is in screening for signs of exhaustion at work. It has been shown that chronic stress among health care personnel may be preventable, if cases at risk are identified at an early stage (Peterson, Bergström, Samuelsson, Åsberg & Nygren, 2008). KEDS is currently included in a screening questionnaire used in an on-going occupational health survey.

Since we have so far only studied the discrimination between ED patients and healthy controls, we do not know whether KEDS has sufficient discriminant validity to aid in differential
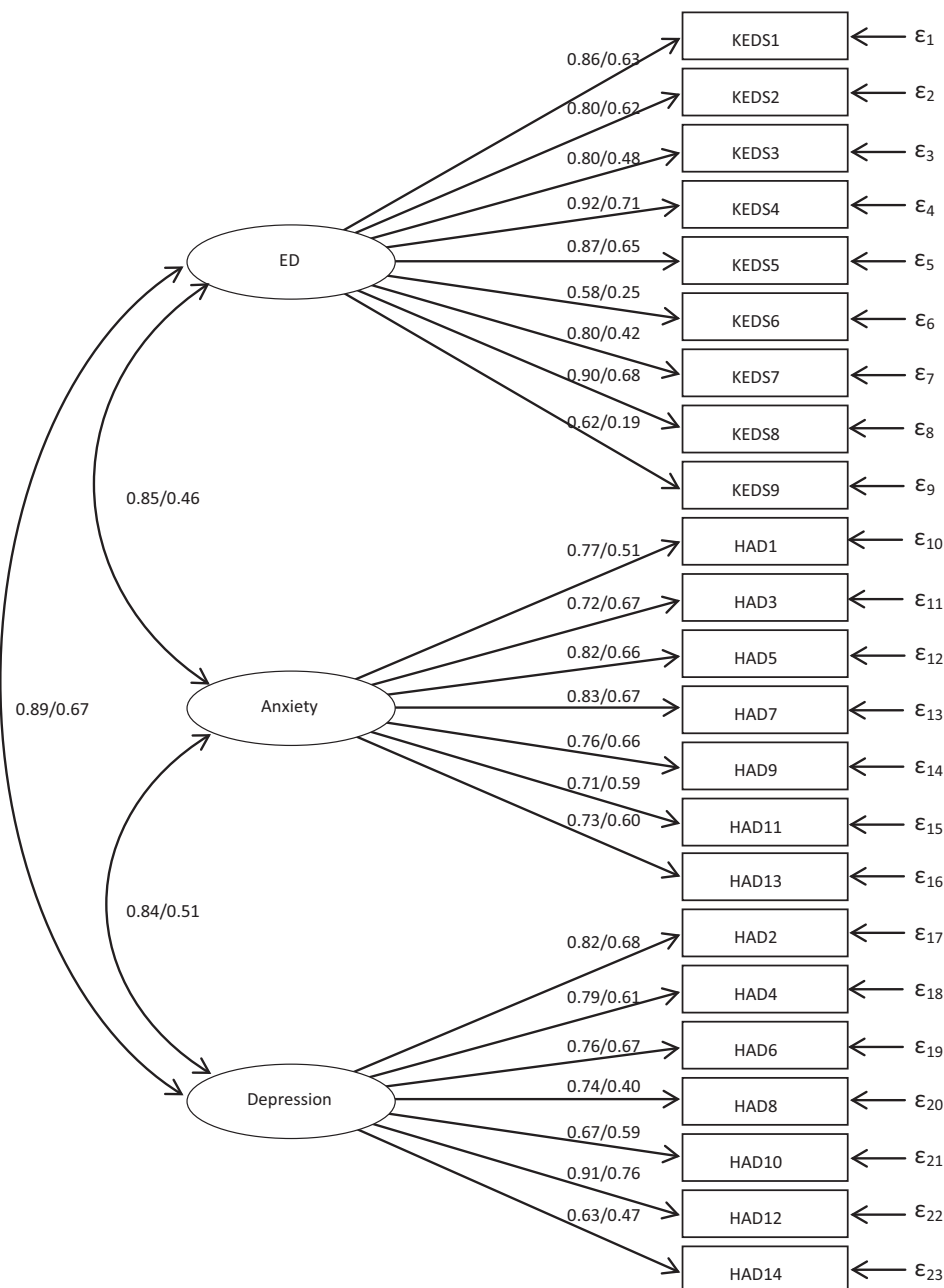
Fig. 2. Confirmatory factor analysis of scores on scales assessing ED (KEDS), depression and anxiety (HAD). Parameter values for the model with three separate latent variables. The first parameter value has been calculated using the full sample and the second value has been calculated using only the patients. All parameters are significant ($p < 0.02$).

diagnosis between different disorders. Patients with major depressive disorder may well reach high scores on KEDS, although the symptom profile may differ from ED. This issue remains to be studied.

So far, KEDS has not been compared with other scales developed for prolonged fatigue or stress induced disorders, such as the Schedule of Fatigue and Anergia (SOFA) (Hadzi-Pavlovic, Hickie, Wilson, Davenport, Lloyd & Wakefield, 2000), the stress-related Exhaustion Disorder (s-ED) scale (Glise *et al.*, 2009), and the Karolinska Exhaustion Scale (KES, Saboonchi *et al.*, 2012). Such studies are currently underway.

The sharp discrimination between controls and patients in our study suggests that KEDS will be useful for distinguishing between cases of normal tiredness and ED, and for identifying employees at risk for ED. A recently completed study shows that KEDS is sensitive enough to reflect effects of treatment and rehabilitation in ED (Besèr, Borg, Herlin, Nygren & Åsberg, 2013).

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APPENDIX

Karolinska Exhaustion Disorder Scale

The purpose of this form is to provide an overall picture of your current (physical/emotional) state. We would like you to try to rate how you have been feeling during the past two weeks.

This form contains a series of statements about how one can feel in several different respects. These statements express different degrees of uneasiness, from lack of discomfort to a maximum and pronounced feeling of unease.

Draw a cross in the square in front of the number that you think corresponds best to the way you have been feeling the past two weeks. (See the example below.)

☐ 0

☐ 1

☒ 2

☐ 3

☐ 4

☐ 5

☐ 6

If you want to change your assessment, please do this by filling the entire square and draw a new cross in the appropriate square. (See example below)

☐ 0

☒ 1

■ 2

If you wish to explain/clarify something, feel free to do so on the last page, under "Notes."

1   **Ability to concentrate**

We would like you to assess your ability to keep your thoughts together and concentrate on various activities. Think about how you function in various activities that demand different levels of concentration, e.g. reading a complicated text, reading a newspaper article and watching TV.

☐ 0   I do not have any difficulty concentrating, and can read, watch TV and converse normally.

☐ 1

☐ 2   I occas ionally have difficulty keeping my thoughts together on things that would normally hold my attention.

☐ 3

☐ 4   I have often difficulty concentrating.

☐ 5

☐ 6   I cannot concentrate on anything at all.

2   **Memory**

We ask here that you describe your ability to remember things. Think about whether or not you have had difficulty recalling names, dates, or tasks that you intend to do during a regular day.

☐ 0   I remember names, dates, and what I am supposed to do.

☐ 1

☐ 2   Sometimes I forget things that are not so important, but if I pull myself together I can usually remember.

☐ 3

☐ 4   I often forget appointments or names of people whom I know very well.

☐ 5

☐ 6   Every day, I forget important things or what I have promised to do.

3   **Physical stamina**

This i s a question concerning your physical stamina. Do you feel, for example, more exhausted than usual after the activities of an ordinary day or some form of physical exertion?

☐ 0   I feel the way I usually do and perform my daily physical activities or exercise as usual.

☐ 1

☐ 2   I feel that physical effort is more exhausting than normal, but still move the way I usually do in this respect.

☐ 3

☐ 4   I do not have the energy to exert myself physically. It is OK as long as I move at a normal phase, but I c annot increase my pace without becoming shaky and short of breath.

☐ 5

☐ 6   I feel very weak and cannot even move short distances.

REMEMBER that your assessment refers to the past two weeks.

4   **Mental stamina**

We would like you to reflect here on your mental stamina and to what extent you are more mentally exhausted than usual in various everyday situations.

☐ 0   I have just as much energy as usual. I do not have any particular difficult performing my daily activities.

☐ 1

☐ 2   I can manage my everyday activities, but they take more energy and I am exhausted more quickly than usual. I need to take breaks more often than usual.

☐ 3

☐ 4   I become inordinately tired when I attempt my daily activities and find social situations exhausting.

☐ 5

☐ 6   I do n ot have the energy to do anything.

5   **Recovery**

We ask you to describe here how well and how quickly you recover mentally and physically when you
have been exhausted.

☐ 0   I do not have to rest during the day.

☐ 1

☐ 2   I become tired during the day, but all I have to do is to take a little break in order to recover.

☐ 3

☐ 4   I become tired during the day and need to take long breaks in order to feel fit.

☐ 5

☐ 6   No matter how much I rest, it feels as if I am unable to recharge my batteries.

6   **Sleep**

We ask you to describe your sleep. Think about how long you have slept and the quality of your sleep
during the past two weeks. Your assessment should reflect your actual sleep, regardless of whether or not
you have taken sleeping pills.

☐ 0   I sleep well and long enough. I usually feel thoroughly rested when I wake up after a night's sleep.

☐ 1

☐ 2   Sometimes, I sleep more restlessly than usual, or wake up during the night and have difficulty going
       back to sleep. Sometimes, I do not feel thoroughly rested when I wake up after a night's sleep.

☐ 3

☐ 4   I often sleep more restlessly than usual, or wake up during the night and have difficulty going
       back to sleep. I often have a feeling of not being thoroughly rested after a night's sleep.

☐ 5

☐ 6   I sleep superficially or restlessly every night. I never feel thoroughly rested after a night's sleep.

REMEMBER that your assessment refers to the past two weeks.

7   **Hypersensitivity to sensory impressions**

This is a question about the extent to which one or several of your senses have become more sensitive to
impressions, such as sound, light, smell or touch.

☐ 0   I do not think that my senses are more sensitive than usual.

☐ 1

☐ 2   Sound or light or other sensory impressions are sometimes unpleasant.

☐ 3

☐ 4   I often experience that sound, light or other sensory impressions are disturbing or unpleasant.

☐ 5

☐ 6   Sound, light or other sensory impressions bother me so much that I withdraw in order to give my
       senses a chance to rest.

8   **Experience of demands**

Here we ask you to give expression to the way you react to demands in your daily life. These demands can come from your surroundings or be your own demands on yourself.

☐ 0   I do what I am supposed to do or want to do without experiencing it as especially demanding or difficult.

☐ 1

☐ 2   Sometimes I experience daily situations that I used to handle without any particular problem as demanding, leading to unease, or causing me to become more easily stressed.

☐ 3

☐ 4   I often feel that situations that I previously handled without problem are now demanding and cause a strong feeling of uneasiness or stress.

☐ 5

☐ 6   l experience nearly everything as demanding and cannot handle it at all.

9   **Irritation and anger**

This question regards how easily irritated or angry you become, regardless of whether or not you show it. Think especially about how quick tempered you have been in relationship to the source of your irritation, and how often and intensively you have become angry or irritated. If you have not had any such feelings at all, then you should mark "0."

☐ 0   I do not feel that I am especially easily irritated.

☐ 1

☐ 2   I am more impatient and easily irritated than usual, but the feeling quickly passes.

☐ 3

☐ 4   I become more impatient and easily irritated than usual. Sometimes I lose control in a way that is unusual for me.

☐ 5

☐ 6   I am often furious and have to make an enormous effort in order to restrain myself.

REMEMBER that your assessment refers to the past two weeks.