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Psychometric qualities of a brief self-rated fatigue measure The Fatigue Assessment Scale

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Abstract

Objective: The main aim of this study was to examine the dimensionality and psychometric qualities of a new 10-item fatigue measure, the Fatigue Assessment Scale (FAS). **Methods:** As part of a longitudinal study, the respondents, all workers with at least 20 working hours per week, completed the FAS, four related fatigue measures, a depression questionnaire, and an emotional stability scale. **Results:** The FAS had a high internal consistency. The pattern of correlations and factor analysis showed good convergent and divergent validity. The FAS correlated strongly with the other fatigue scales. In a factor analysis of the five fatigue questionnaires, the FAS had the highest factor loading on a clear one-factor solution. Moreover, factor analyses revealed that fatigue, on the one hand, and depression and emotional stability, on the other hand, are separate constructs. Finally, it was shown that 8 out of the 10 FAS items were unbiased concerning gender; two had a uniform bias. **Conclusions:** The FAS represents a potentially valuable assessment instrument with promising internal consistency reliability and validity. Gender bias in the FAS does not have consequences for use of the FAS.

Keywords: Fatigue assessment scale; Gender bias; Reliability; Validity

Introduction

The first objective of this study was to examine the psychometric qualities of a new fatigue measure, the Fatigue Assessment Scale (FAS) [1]. The second objective was to analyze possible gender and age differences and to test for the existence of gender bias.

Fatigue is a nonspecific symptom that is highly prevalent among patients in primary health care (e.g., Refs. [2–4]). It is an important component of many physical diseases and psychiatric disorders. For instance, fatigue is one of the most pervasive symptoms experienced by patients suffering from chronic diseases like cancer [5] and multiple sclerosis [6]. Hence, several, often multidimensional, fatigue questionnaires have been developed for specific populations such as cancer patients [5,7,8] and multiple sclerosis patients [6]. Fatigue also plays a substantial role in the healthy population. Severe fatigue during a relatively long period can lead to sick leave and work disability. For example, in the Netherlands, over one-third of the recipients of work disability benefit is occupationally disabled on mental grounds [9]. The majority of these individuals suffer from chronic job stress and burn-out. The most characteristic component of burn-out [10] is emotional exhaustion, a fatigue-related concept. Several measures of fatigue are claimed to be useful in patient populations as well as in healthy individuals [11,12].

Due to the fast growing number of persons suffering from chronic fatigue syndrome in the nineties, interest in fatigue has expanded considerably. This has led to an intense debate about the conceptualization of fatigue, as well as its determinants, manifestations, and direct and indirect consequences. One vehemently debated issue is the dimensionality of fatigue. Nowadays, there is a tendency to claim that fatigue is best conceived of as a multidimensional construct [13,14]. However, so far, there is no convincing evidence for this view [1]. Statements regarding the multidimensionality of fatigue are based predominantly on the outcomes of factor analyses using the criterion of eigenvalues greater than 1.0 as indicator in order to choose the number of factors (e.g., Refs. [11,15,16]). However, this particular criterion greatly overestimates the number of

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factors and often causes factors to split into bloated specifics (e.g., Refs. [17,18]). Other studies have used confirmatory factor analyses to examine the dimensionality of fatigue (e.g., Refs. [12,13]) and claim a good fit for a multidimensional model. Smets et al. [12], however, did not examine whether a one-factor solution would have fit their data equally well. Furthermore, Åhsberg [13] pointed to lack of energy as a general latent factor that represented much of the common variance in items also assessing physical exertion, physical discomfort, lack of motivation, and sleepiness. In line with these investigations, two recent studies examined the dimensionality of fatigue by factor analyzing broad sets of multidimensional fatigue questionnaires [1,19]. Neither exploratory factor analyses supported the differentiation of fatigue in cognitive, emotional, somatic, and general aspects of fatigue. Instead, clear one-factor solutions were found in a healthy population [1,19], as well as in a group of chronic pain patients [19].

Consequently, the FAS, a measure of chronic fatigue, was developed [1]. The initial item pool consisted of 40 items taken from four commonly used fatigue questionnaires: the Fatigue Scale (FS) [11]; the Checklist Individual Strength (CIS) [20], the Emotional Exhaustion (EE) subscale of the Dutch version of the Maslach Burnout Inventory (MBI-NL) [10], and the Energy and Fatigue subscale of the World Health Organization Quality of Life assessment instrument (WHOQOL-EF) [21]. A semantical analysis [21] was done in order to guide the selection of items from this item pool. Nine semantical groups were distinguished. One extra group was added in order to have an even number of items representing mental fatigue and physical fatigue. The initial objective was not to develop a one-dimensional scale. At the end of the construction process, the FAS consisted of 10 items (see Appendix). The first examination of the psychometric qualities of the FAS demonstrated high reliability. Furthermore, factor analysis revealed that the FAS measured one construct.

With regard to age differences in relation to chronic fatigue, the psychological literature is rather equivocal. Some researchers have found a sizeable effect of age on fatigue [22], while others have reported only weak associations or even failed to observe any difference [23–25]. For instance, David et al. [26] have reported a positive, but low, correlation between age and fatigue, taking duration of fatigue into account.

In a comprehensive review article, Lewis and Wessely [24] have demonstrated convincingly that women report fatigue two to three times more often than men. Similar results were obtained in other studies (e.g., Ref. [27]). In constrast, a sizeable number of studies did not contain such outcomes [26,28]. However, these differences can be caused by items with gender bias [29]. An item is an unbiased measure of a theoretical construct (e.g., fatigue) if persons from different groups (e.g., males and females), who are equally tired, have the same average score. To date, no systematic research has been done to examine such bias in fatigue items. However, without checking item bias, it remains unclear whether results documenting gender differences in fatigue reflect true mean differences, gender item bias, or a combination of both.

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

Method

Subjects

Randomly selected subjects, after receiving a telephone call, agreed to complete a number of questionnaires as part of a study with five measurement points. This prospective study focused on a population with a minimum employment of 50%. The data presented here were collected at the last measurement time point. Three hundred and fifty-one persons (55%) out of a group of 635 returned a completed test booklet, 183 men (M = 45 years; S.D. = 8.39) and 166 women (M = 43 years; S.D. = 9.50). The gender of two respondents was unknown.

Measures

The complete set of measures was sent by post to the participants. The respondents were asked to complete five fatigue scales: the FAS [1], the CIS-20 [20], the MBI-EE [30]; Dutch version [10]), the WHOQOL-EF [21], Dutch version [31], and, finally, the FS [11], Dutch translation [32]. In addition, the test booklet contained questionnaires to assess depression (Center for Epidemiological Studies — Depression Scale [CES-D] [33]) and emotional stability (FFPI-ES [34]).

The 10-item FAS is a new, unidimensional fatigue scale. Nine of the 10 items were selected from an initial item pool consisting of 40 items taken from four commonly used fatigue questionnaires: the FS [11]; the CIS [20], the MBI-EE [10], and the WHOQOL-EF [21]. The instruction of the FAS is directed at how a person *usually* feels. The 5-point rating scale varies from 1, *never*, to 5, *always*. Cronbach's alpha of the FAS in the test population (n = 1835), representative for the Dutch population, was good (.87). Factor analysis showed that the FAS measured one construct. Mokken Scale Analysis [35,36] also revealed that the FAS formed one reliable scale. The latter analysis is a method from item response theory (e.g., Ref. [37]), which is very suitable for constructing scales for psychological constructs such as fatigue. To order persons reliable on a scale, the scalability coefficient H [38] has to be at least .3. However, higher values are desirable. In a previous study [1], the scalability coefficient H of the FAS was .47.

The CIS consists of 20 items and provides a total score and scores for four subscales: Subjective Experience of Fatigue (SEF; 8 items), Reduction of Concentration (CON; 5 items), Reduction of Motivation (MOT; 4 items), and Reduced Level of Physical Activity (PA; 3 items). The items are scored on 7-point rating scales (1, *yes, that is true*, to 7, *no, that is not true*). The CIS appears to be reliable and valid for CFS patients [20]. The reliability coefficient for the total score was .90; for the subscales it was .88, .92, .83, and .87, respectively. The CIS yielded different scores for the CFS, MS, and abdominal pain patients. The subscales of the CIS correlated significantly with comparable scales [20]. Although originally developed and validated for use with CFS patients, it is claimed to be appropriate for healthy populations as well [39].

The EE scale has five items, each with a 7-point rating scale ranging from 1, *never*, to 7, *always*. The burn-out component EE focuses on the feelings of being emotionally overextended and drained of one's emotional resources. The psychometric properties are good [10]. The internal consistency of the EE scale is .83, and the scale also has good construct validity [10].

The WHOQOL-100 is a multidimensionally conceptualized, generic, 100-item quality of life instrument [21]. The WHOQOL-EF [31] contains four items with a 5-point response scale (1, *never*, to 5, *always*): two positively phrased items referring to "energy" and two negatively phrased items containing the word "fatigue." The reliability and validity appear to be good [31]. Its Cronbach's alpha is .95 and the EF scale correlates highly with the fatigue and vigor subscales of the POMS [31].

The FS, with a 5-point rating scale (1, *never*, to 5, *always*), distinguishes Mental Fatigue (four items) from Physical Fatigue (seven items). In addition, a total fatigue score can be calculated. The scale was found to be both reliable and valid [11]. The reliability coefficient for the total scale is .89; for the subscales, .82 and .85, respectively [11].

The CES-D [33] is a 20-item well-established self-report scale designed to measure the presence and degree of depression symptomatology in broad-based survey research populations. The rating scale ranges from 1, *seldom or never*, to 4, *(almost) always*. For the Dutch population, reliability and criterion validity are good [40,41]. Beekman et al. [41] found excellent sensitivity for major depression in an older sample of the Dutch population. In addition, in a large Dutch patient population, Cronbach's alpha was .91 [40].

The Emotional Stability (FFPI-ES) scale of the Five Factor Personality Inventory (FFPI; [34]) consists of 20 items with a 5-point rating scale, ranging from 1, *never*, to 5, *always*. The scale is internally consistent (Cronbach's alpha = .85) and valid [34].

Statistical procedure

All analyses were done using SPSS 9.0 [42]. First, internal consistency analyses (Cronbach's alpha) were performed on all scales. To study the convergent validity, uncorrected associations as well as correlations adjusted for item overlap among the eight fatigue subcales and the FAS were calculated. Furthermore, a principal components analysis of the FAS and the eight subscales of the other fatigue questionnaires was performed. To examine the divergent validity of the FAS, Pearson correlations were determined and factor analyses were conducted concerning (i) fatigue and depression, and (ii) fatigue and emotional stability. The scree plot of the principal components analysis was used to detect the number of factors. The extracted factors were varimax rotated.

Possible gender and age group differences on the FAS, and gender bias, were exploratively tested at the item and total score level, using one-way analyses of variance and t tests. To study age group differences, four groups were formed with equal numbers of participants [age categories 21–37 years ($n = 89$; $M = 32.61$; S.D. = 4.0), 38–44 years ($n = 90$; $M = 40.97$; S.D. = 2.1), 45–51 years ($n = 92$; $M = 47.97$; S.D. = 2.1), and 52–65 years ($n = 78$; $M = 55.88$; S.D. = 3.4)]. The conditional ANOVA and t test were used for different reasons. In the conditional ANOVA, the item score is the dependent variable, while gender and score levels are the independent variables. By controlling for score level, the conditional ANOVA is able to detect gender bias. The one-sample t test procedure tests whether the mean of a single variable differs from a specified constant. It is possible that the t test will not find gender differences in the scores of a biased item (e.g., the mean of both women and men is 3.0). Due to gender bias, women are triggered to report more fatigue than they actually experience. In this example, women report more fatigue than they actually experience. The item mean of women without gender bias would be, for instance, 2. However, because of the gender bias, this gender difference is not reflected in the t test, which tests the observed means of men and women. Therefore, it is necessary to perform both analyses.

Item bias analysis was performed using conditional ANOVA [29]. Therefore, score level groups were formed containing at least 50 persons. When both the gender main effect and the interaction of score level and gender are nonsignificant, then an item is considered unbiased. A significant main effect of gender means that the item has uniform bias. Then, the difference in the means curve is consistently above or below zero. Uniform bias refers to influences of bias on scores that are more or less the same for all score levels. A significant interaction between score level and gender indicates that the difference between men and women is not invariant across score levels. In this case, the item has nonuniform bias. When some items are biased, a second total score has to be calculated by summing the unbiased items. Then, the difference between the means of the males and females is divided by the pooled standard deviation. This procedure has to be followed for both the normal total score and the revised total score with only unbiased items. When the difference is negligible, the normal total score is valid.

Results

In Table 1, the means, standard deviations, and Cronbach's alpha coefficients of the various scales are presented. The internal consistency of the FAS was .90. Exploratory factor analysis of the FAS items showed a unique factor supported by the scree plot. The factor loadings varied from .82 ("I am bothered by fatigue") to .55 ("When I am doing something, I can concentrate quite well"). The factor explained 53% of the variance. In addition, a factor analysis of the FAS and the eight subscales of the other fatigue questionnaires also revealed one factor, explaining 67% of the variance (see Table 2). In the latter analysis, the FAS had the highest loading.

Pearson correlations between the FAS and subscales of the other fatigue questionnaires were high and significant, ranging from .61 with the Reduced Level of Physical Activity scale of the CIS to .78 with the MBI-EE (all Ps < .001). Table 3 presents these correlations. After controlling for overlap in items by removing t0he items used for the construction of the FAS, the correlations between the FAS and the various fatigue subscales were clearly similar, ranging from .60 (FAS vs. the Reduced Level of Activity scale of the CIS) to .76 (FAS vs. the CIS-SEF), all Ps < .001 (see Table 3).

Table 1
Mean, standard deviation, and reliability coefficient of the (sub)scales

(Sub)scale	*M*	S.D.	α
CIS total score	53.75	25.58	.96
CIS — Subjective Experience of Fatigue	23.41	12.58	.96
CIS — Reduction of Concentration	12.73	7.24	.92
CIS — Reduction of Motivation	10.42	5.40	.87
CIS — Reduced Level of Physical Activity	7.22	4.42	.88
MBI-EE	2.49	1.11	.88
WHOQOL-EF	10.18	2.91	.88
Fatigue Scale total score	19.95	5.81	.87
FS — Mental Fatigue	6.89	2.03	.72
FS — Physical Fatigue	13.11	4.39	.84
FAS	19.26	6.52	.90

CIS = Checklist Individual Strength [20], MBI = Maslach Burnout Inventory [10,30]; WHOQOL = World Health Organization Quality of Life assessment instrument [21,31]; FS = Fatigue Scale [11,32].

Table 2
Factor loadings of the FAS and the eight subscales, sorted by size

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

CIS = Checklist Individual Strength [20], FS = Fatigue Scale [11,32], WHOQOL = World Health Organization Quality of Life assessment instrument [21,31], MBI = Maslach Burnout Inventory [10,30].

The FAS correlated .65 (P < .001) with the CES-D total score. The scree plot of the principal components analysis on the FAS items and the CES-D items showed a two-factor solution (eigenvalues Factor I: 10.93; Factor II: 2.88; percentage explained variance: 46%). After varimax rotation, these factors clearly represented Fatigue and Depression. Four depression items had cross-loadings on the fatigue dimension (see Table 4). These items concerned the CES-D subscales Positive Affect ("I was happy," and "I enjoyed life"), and Depressed Affect ("I felt depressed"). One CES-D item from the Somatic Retarded Activity scale ("I felt that everything I did was an effort"), had a higher factor loading on Fatigue than on Depression. Two CES-D items ("I could not get 'going,'" and "I had trouble keeping my mind on what I was doing") only loaded on the Fatigue factor. Furthermore, the FAS total score correlated − .38 (P < .001) with Emotional Stability. The scree plot of a principal components analysis on the fatigue as well as the emotional stability items also pointed to a two-factor solution. The eigenvalues were 9.14 (Factor I) and 3.82 (Factor II), and together the two factors accounted for

Table 3
Correlations and corrected correlations between the FAS and the eight subscales

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

All Ps < .001. Because no items from the MBI-EE were used to design the FAS, no adjusted correlation was calculated.
FAS = Fatigue Assessment Scale [1], CIS = Checklist Individual Strength [20], MBI = Maslach Burnout Inventory [10,30]; WHOQOL = World Health Organization Quality of Life assessment instrument [21,31]; FS = Fatigue Scale [11,32].

43% of the variance. After varimax rotation, the analysis revealed separate Fatigue and Emotional Stability factors without any substantial cross-loadings (see Table 5).

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

Eight of the 10 FAS items were clearly unbiased: the main effect of gender and the interaction of level and gender were nonsignificant. Two items, reflecting level of energy and quantity of daily activities, had uniform bias, showing a significant main effect of gender.

To check whether the computation of the total score of the FAS would need to be adjusted for males and females separately, a new total score was calculated for the eight unbiased items. The mean difference between men and women was taken separately for the normal and adjusted total scores and divided by the pooled standard deviation. For the 10-item total score, the result was .002; for the unbiased total score, .01. Thus, the difference in outcome is negligible: the effect size is equal.

Table 4
Factor loadings of the FAS items and CES-D items in a two-factor solution

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

– Means no factor loading higher than .40. Items in italics are FAS items [1]. The regular font style is used for the CES-D items [33].

Table 5
Factor loadings of the FAS items and the FFPI emotional stability items in a two-factor solution

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

– Means no factor loading higher than .40. Items in italics are FAS items [1]. The regular font style is used for the FFPI items [34].

Discussion

The FAS has good internal consistency. In addition, factor analysis and Mokken scale analysis provided strong evidence for the unidimensionality of the FAS. Moreover, in a factor analysis of a set of well-established fatigue instruments, the FAS had the highest factor loading on a one-factor solution. In an earlier study [1], the reliability of the FAS appeared to be good for the general Dutch population. This initial evaluation also supported a unidimensional conceptualization. In the present study, evidence was obtained that these claims also hold in a working population. In addition, it was demonstrated that the validity of the FAS is good. Concerning divergent validity, it was revealed that fatigue and depression were related but distinct constructs. Fatigue and emotional stability were also found to be distinct concepts. Moreover, neither gender nor age differences were found with respect to FAS scores. Two FAS items were found to demonstrate evidence of gender bias. However, further analysis showed that the bias in these items did not cause appreciable differences regarding the FAS total score. Therefore, correction for gender bias is not indicated.

In the present study, fatigue, measured using the FAS, and depression appeared to be two clearly separate factors. Only in a limited number of instances were substantial secondary loadings obtained; mostly in the case of depression items reflecting negative affect. Here, it should be kept in mind that it is plausible that being unhappy will influence one's experience of fatigue and vice versa. Fatigue and depression are intertwined in a complex way. Fatigue is strongly related to depression (Ref. [43], p. 348), but is not a compulsory or core symptom of the diagnosis [44].

The relationship between fatigue and emotional stability is another important issue for the clarification of the concept of fatigue. Magnusson et al. [45] examined the predictors of state and trait fatigue. They demonstrated that emotional stability was a negative predictor of state fatigue. In addition, Matthews and Desmond [46] found that emotional stability was the main predictor of fatigue. According to them, neurotic individuals may be more fatigue prone, given their general tendency towards stress symptoms [47]. Unfortunately, the authors did not perform a factor analysis to examine whether the constructs are separate dimensions or not.

Only a few FAS items had uniform gender bias. Consequently, a change in computation of the total FAS score does not seem necessary. Further research, however, is needed in order to examine whether these items or other combinations of items are consistently gender biased. Furthermore, it is interesting to check whether the calculation of the total score needs to be changed for men and women. Women did not have higher FAS total scores than men; women only appeared to have significantly less energy. No differences were found in the other nine FAS items. Although this is in contradiction to the observation by Lewis and Wessely [24], who claimed that women reported two or three times more fatigue than men, it is fully in line with recent findings reported by De Rijk et al. [40]. A possible explanation might be that many of the studies cited by Lewis and Wessely measured fatigue using a single item and/or a dichotomous response format.

The finding that different age groups reported similar fatigue experiences might be explained by the healthy worker effect: the phenomenon that people who stay healthy are able to work until their retirement [48,49]. Older respondents in the present study might have been healthier than their peers, who stopped working before the age of retirement. Another explanation has to do with early career burn-out [50]. This phenomenon implies that especially younger people, who are at the beginning of their careers, run a high risk of developing burn-out. Thus, the younger participants might have had higher fatigue levels than they used to have, and, therefore, reported fatigue scores similar to those of the older participants in this study. Of course, it is also possible that a combination of the healthy worker effect and the early career burn-out phenomenon has led to the present results.

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

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Appendix. Fatigue Assessment Scale (FAS)

The following 10 statements refer to how you usually feel. For each statement you can choose one out of five answer categories, varying from *never* to *always*. 1 = *never*, 2 = *sometimes*; 3 = *regularly*; 4 = *often*; and 5 = *always*.

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

Between brackets, the questionnaire is given from which the item is taken. WHOQOL = World Health Organization Quality of Life assessment instrument [21,31]; CIS = Checklist Individual Strength [20]; FS = Fatigue Scale [1]. Items 4 and 10 require reversed scoring. The scale score is calculated by summing all items.

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