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Review

# Fatigue Rating Scales Critique and Recommendations by the Movement Disorders Society Task Force on Rating Scales for Parkinson's Disease

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**Abstract:** Fatigue has been shown to be a consistent and common problem in Parkinson's disease (PD) in multiple countries and cultures. It is one of the most disabling of all symptoms, including motor dysfunction, and appears early, often predating the onset of motor symptoms. Several studies of the epidemiology of fatigue have been published, often using different scales, but few on treatment. The Movement Disorder Society (MDS) commissioned a task force to assess available clinical rating scales, critique their psychometric properties, summarize their clinical properties, and evaluate the evidence in support of their use in clinical studies in PD. Six clinical researchers reviewed all studies published in peer reviewed journals of fatigue in PD, evaluated the scales' previous use, performance parameters, and quality of validation data, if available. Scales were rated according to criteria provided by the MDS. A scale was "recommended" if it has been used in clinical studies beyond the group that developed it, has been used in PD and psychometric studies have established that it is a valid, reliable and sensitive to change in

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people with PD. Requiring a scale to have demonstrated sensitivity to change in PD specifically rather than in other areas in order to attain a rating of "recommended" differs from the use of this term in previous MDS task force scale reviews. "Suggested" scales failed to meet all the criteria of a "recommended" scale, usually the criterion of sensitivity to change in a study of PD. Scales were "listed" if they had been used in PD studies but had little or no psychometric data to assess. Some scales could be used both to screen for fatigue as well as to assess fatigue severity, but some were only used to assess severity. The Fatigue Severity Scale was "recommended" for both screening and severity rating. The Fatigue Assessment Inventory, an expanded version of the Fatigue severity Scale, is "suggested" for both screening and severity. The Functional Assessment of Chronic Illness Therapy-Fatigue was "recommended" for screening and "suggested" for severity. The Multidimensional Fatigue Inventory was "suggested" for screening and "recommended" for severity. The Parkinson Fatigue Scale was "recommended" for screening and "suggested" for severity rating. The Fatigue Severity Inventory was "listed" for both screening and severity. The Fatigue Impact Scale for Daily Use, an adaptation of the Fatigue Impact Scale was "listed" for screening and "suggested" for severity. Visual Analogue and Global Impression Scales are both "listed" for screening and severity. The committee concluded that current scales are adequate for fatigue studies in PD but that studies on sensitivity and specificity of the scales are still needed. 

**Key words:** fatigue; Parkinson's disease; rating scales-fatigue rating scales

Fatigue is a common and poorly understood symptom that occurs in many medical and psychiatric disorders.[1,2] In Parkinson's disease (PD), fatigue frequently presents early in the disease course and prevalence increases with disease progression, affecting up to 58% of patients.[3,4] Despite the fact that fatigue is difficult to define, prevalence figures are quite similar around the world. Fatigue may be an important determinant of quality of life[5–7] and physical disability in PD.[7] It is also a significant source of work-related disability in PD, being the single most cited symptom on successful claims for Social Security Disability Insurance in the United States.[8] Yet, despite its prevalence and impact in PD, fatigue is under-recognized, even in specialized movement disorder clinics,[9,10] and its treatment is uncertain.[11–14] Given the relevance of fatigue to the clinical management of PD, the Movement Disorder Society-sponsored revision of the Unified PD Rating Scale includes an item assessing fatigue.[15]

To facilitate research and clinical practices aimed at improving the recognition and treatment of fatigue in patients with PD, the Movement Disorders Society convened a task force to evaluate the fatigue rating instruments that have been used in published studies in PD. This review is part of a process to assess scales currently in use for evaluating clinical aspects of PD.

## PATIENTS AND METHODS

### Critique Process

The Steering Committee of the MDS Task Force on Rating Scales for PD invited JHF to select and chair an international group of experts on fatigue in PD and rating scales, to produce a critique of all the scales that have been used in assessing fatigue in PD. As there have been relatively few studies of fatigue in PD, the committee consisted of only 6 members and included 4 neurologists, 1 psychiatrist, and a nurse. Four members were from Europe and 2 were from the United States.

The committee was assigned the task of selecting the scales for the review and providing a written summary of the descriptive properties, psychometric performance, and overall impression of each scale with respect to its use in patients with PD. All publications on fatigue in PD identified on internet literature searches (see methods below) were reviewed and their scales identified. Committee members were then selected to review each scale and provide a written review for feedback from every other member of the committee. To provide information that would be consistent with previous MDS task force reviews of non-motor symptom rating scales,[16–19] the committee elected to review each of the selected scales using a fatigue-specific adaptation of the pro forma template created initially for the review of depression rating scales. In the final assessment of each scale, reviewers provided an assessment regarding its use according to the following definitions (separately for screening and severity): (1) "recommended": the scale has been applied to PD populations; there are data on its use in clinical studies beyond the group that developed the scale; and, it has been studied psychometrically in PD and found valid, reliable and sensitive to change; (2) "suggested": the scale has been applied to PD populations, but only one of the other criteria applies; (3) "listed": the scale has been applied in PD populations, but the other two criteria are not met. These definitions are similar to the designations used by the MDS to develop the Appendix of ancillary scales to complement the MDS-UPDRS[15] and for previous reviews of scales to assess neuropsychiatric disturbances in PD[16–19] except that other scale review committees used the term "recommended" when there was psychometric data on a scale's psychometric properties but not nec-

essarily in PD. In addition, this review limited the term's use for severity rating to those scales shown to be sensitive to change. After this general assessment, the chair compiled and summarized the reviews and conclusions in an initial draft, which was reviewed by all committee members and altered in response to those comments. The draft was then submitted to the Steering Committee for criticisms, which were then incorporated into the draft that was submitted to the Scientific Issues Committee of the MDS before submission to the Movement Disorders journal. The pro forma reviews for each scale are available on the MDS website.

### Selection of Scales

As fatigue is a common symptom in medical and psychiatric disorders, there are a large number of published studies on fatigue across the spectrum of medical and psychiatric disorders.[20] Only one scale, The Parkinson Fatigue Scale (PFS)[21] was developed specifically for PD and has been applied only in PD samples. Accordingly, the committee unanimously agreed to restrict its critiques to scales used in published studies of fatigue in PD. It also chose to focus on scales devoted only to fatigue, thus excluding scales that assess clinical symptoms more broadly, such as health-related quality of life scales, even though they may have sections devoted to fatigue.

### Literature Search

PubMed was searched for relevant papers with the terms "PD," "parkinsonism," or "Parkinson disease" and "fatigue" published until October, 2008. Parkinson disease is a MeSH term, as is fatigue. Both Pubmed and MeSH terms were used to confirm a complete literature. For each scale identified, another search was conducted for the terms PD ("parkinsonism" or "Parkinson disease") and the name of the scale. Medline was also used to search for articles citing the original articles related to the development and use of the individual scales. Reference tracking also was used to identify articles. Only published or in press peer-reviewed papers or published abstracts were evaluated.

## RESULTS

### Identified Scales

Seven fatigue rating scales were identified that have undergone validation and have been used in PD: the Fatigue Severity Scale (FSS), Fatigue Assessment Inventory (FAI), Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-F) scale, Multidimensional Fatigue Inventory (MFI), PFS, Fatigue Severity Inventory (FSI), and the Fatigue Impact Scale for Daily Use (D-FIS). Visual analogue scales (VASs) and clinical global impression scales (CGIS), including the Rhoten Fatigue Scale (RFS), are also addressed as they have been used in fatigue studies in PD. These scales were used primarily to provide confirmatory support for the other identified scales, but their psychometric properties have not been studied. The profile of mood states (POMS), which has been used in six studies of PD, has one subscale addressing fatigue-inertia.[22] This subscale was not reviewed in detail because it is a component of a larger scale. There is little separate information on the psychometric properties of this subscale in PD apart from demonstration of convergent validity with the MFI and FSI in one study.[23]

Each scale was given a rating, as suggested by the MDS, for screening and for severity, and these are included in the table.

### Confounds Associated With the Application of Fatigue Rating Scales

#### Inconsistent Definitions of Fatigue

In the absence of a biological marker or gold standard for defining fatigue, the lack of a consistent definition for fatigue represents the greatest challenge to its measurement. The presence of subtypes of fatigue is another source of scale variation that influences psychometric performance. Peripheral fatigue refers to actual muscle fatigue induced by repetitive contractions[24,25] and can be measured objectively as decreased force generation or the inability to sustain repetitive movements. Although central fatigue, the perception of feeling fatigued, is the usual focus of subjective complaints of fatigue, patients do not necessarily distinguish muscular fatigue that occurs with exercise from their subjective perceptions of fatigue.[2,23] Central fatigue is generally described as an abnormal degree of persistent tiredness, weakness, or exhaustion that is mental, physical, or both in the absence of motor or physical impairment outside the central nervous system.[24–26] Physical fatigue (PF) involves a sense of physical exhaustion and lack of energy to perform physical tasks despite the ability and motivation to perform them. Mental fatigue (MF) refers to the cognitive effects experienced during and after prolonged periods of demanding cognitive activities and tasks that require sustained concentration and mental endurance, such as driving in busy traffic. Assessments of cognitive and

motor processing over a given time interval provide objective measures of the mental and physical components of central fatigue. However, the overlap between MF and PF symptoms may not be clear on rating scales; not all scales distinguish the two types of fatigue. Sleep may be a confounding factor as well.

Only two of seven reviewed scales provide an explicit definition of fatigue for the respondent. These were the D-FIS and the FAI. Although there are objective measures of neuromuscular fatigue, the experience of fatigue as a symptom is subjective, and all of the rating scales are, appropriately, self-rated. However, as the constructs of fatigue are variably defined by the developer of each scale, the various scales may attach different weights to different aspects of fatigue depending upon the scale developer's conceptualization of fatigue, which features of fatigue are addressed by the scale items, and the respondent's own interpretation of the questions.[25] Because there are controversies around the definition of fatigue, provision of a definition preceding the scale generally represents an advantage; it makes explicit what concepts are embedded in the definition of fatigue for that scale and the constructs inherent to the development of the scale. Such knowledge facilitates selection of the most adequate instrument for a given purpose.

The subjective nature of fatigue also affects the ability of fatigue rating scales to provide valid measures of variations in fatigue severity. Some scales measure the presence or absence of fatigue-related symptoms on a spectrum without creating a threshold for a determination of yes-"fatigued" or no-"not fatigued." Other scales may be used to classify patients as suffering from fatigue. Availability of a metric that defines minimal, mild, moderate, and severe fatigue provides a basis for clinical interventions and outcomes assessments. However, in the absence of "external markers" for fatigue, the limits and thresholds for perceptions such as fatigue are difficult to determine. The same theoretical degree of fatigue will not be perceived with the same intensity by different subjects and its manifestation will be differentially modulated by personal factors.

### Overlap of Fatigue With Neuropsychiatric Disturbances

The interpretation of fatigue assessments is significantly confounded by the association of fatigue with other nonmotor symptoms frequently associated with PD, especially depression, anxiety, cognitive dysfunction, apathy, and sleep disturbances. Fatigue is one of the diagnostic criteria for the DSM-IV diagnoses of a major depressive episode as well as generalized anxiety disorder,[26] and it is often included as one of the items in mood symptom rating scales. Sleep and cognitive difficulties are also diagnostic criteria for depressive and anxiety disorders. In patients with PD, multiple studies have shown that fatigue is associated with higher rates of depressive symptoms, but it also occurs in nondepressed patients.[3,4] In one series, 43.5% of patients without depression, dementia, or sleep problems still reported fatigue, in contrast to 4.5% of controls.[27] In some regression analyses, the presence of fatigue was predicted only by depressive symptoms, whereas a recent study found that depression, anxiety, pain, axial symptoms, and reduced motivation (RM) were predictive.[28] As treatments for fatigue may be different than those used to treat depression or anxiety, it is important that rating scales are sensitive to the detection of fatigue in patients without mood symptoms. Longitudinal analyses that include DSM-IV diagnoses, mood symptom ratings, and fatigue rating scales provide a basis for determining whether the scales are sensitive to changes in fatigue over time relative to the experience of mood symptoms.

Symptoms of fatigue and cognitive dysfunction also overlap in PD, resulting in several influences on the validity of self-report rating scales. The severity of cognitive dysfunction in PD, especially the presence of dementia, may preclude valid completion of self-report scales. Cognitive changes in PD, even early in its course, may include attentional difficulties that overlap with the phenomenon of MF, manifesting as difficulties with sustained attention or with initiation of activities.[23] Several studies show that fatigue is associated with greater cognitive dysfunction in PD.[4,29,30] Even though fatigue also occurs in patients with PD with no or limited cognitive dysfunction, presence of MF may be least evident to those most affected by cognitive dysfunction and may be difficult to distinguish from apathy. Patients may also be unable to distinguish fatigue symptoms from sleepiness on self-report scales.

## Critique of Fatigue Scales

### Unidimensional Versus Multidimensional Scales

Scales may be aimed at measuring a single (unidimensional) or diverse attributes (multidimensional) of the construct being measured. Unidimensionality is an inherent characteristic to a physical measure (e.g., distance or volume), but the constructs in health-related areas are often complex so that it may be easier to capture a set of aspects connected to them by means of multidimensional evaluations. However, although

scales that assess different manifestations of a feature (e.g., PF and MF) are multidimensional, each domain (subscale) needs to be unidimensional. This is a fundamental assumption in traditional as well as modern psychometric theory[31] that may or may not be met both at the subscale and total scale levels, depending on conceptualization and operationalization of the construct. Frequently, multidimensional scales intend to represent the construct's value by means of a global score obtained from the sum of their components' scores, but such strategy has scientific problems.[32,33] For example, individual item scores are usually ordinal rather than continuous. In addition, response options from different items are considered equivalent, and the contribution of the items to the final score is assumed to be homogeneous, which is not always accurate. Solutions for this dilemma are not easy because the alternatives are not free of problems.[34] In this situation, it is recommended that: (1) development and analysis of rating scales be carried out with strict compliance to the highest and most updated quality standards; (2) outcomes must always be interpreted with caution; and (3) new theories and models must be developed and explored.

## The Fatigue Severity Scale

### Scale Description

The FSS is a self-administered unidimensional generic 9-item fatigue rating scale.[35] The FSS emphasizes functional impact of fatigue and contains items on physical and MF and social aspects, although these are not divided in explicit domains. Items are brief and easily understandable statements related to fatigue. These are rated on a seven-grade Likert scale of which only the respective ends are defined ("completely disagree" = 1 to "completely agree" = 7). The total FSS score represents the mean score of each of the nine items, yielding a score range between 1 and 7, higher scores indicating a higher level of fatigue. Although not explicitly recommended in the original study,[35] a cut-off of 4 and a time frame covering the past 2 weeks are used by the developers and most other groups.[35] However, other cut-off values have been used and suggested to be more appropriate.[36] The FSS is the most frequently used fatigue-specific scale in chronic diseases[37] and has been translated to numerous languages. Its psychometric properties have been assessed in various diseases[35,38–54] and the general population.[3] The FSS provides no definition of fatigue.[35] The scale is copyrighted but freely available from its developers.

### Psychometric Properties

Studies in non-PD populations usually demonstrate high rates (>95%) of data being fully computable.[41,55] Floor- and ceiling-effects are generally low.[39,48] Score distribution is normal.[39,56] The FSS discriminates significantly between diseased and nondiseased subjects.[41,49,51,53] Construct validity of the FSS is further supported by usually moderate to strong correlations with VASs and various fatigue rating scales.[35,47,49,50,52,53,57–59] Expected correlations have also been observed with scales measuring partly related constructs including depression,[35,60,61] daytime sleepiness,[35,43] sleep quality, and quality of life.[39,45,51,62,63] Factor analysis demonstrates unidimensionality of the FSS in various patient groups,[45,46,52] although misfit of single items has been reported.[42,50] Internal consistency is high (Cronbach's alpha values $> 80$).[35,40,45,46,48,50–54] Interitem correlations range from 0.35 to 0.91 in diseased people, with somewhat lower values found in the general population.[36,39,53] Corrected item-total correlations and intraclass correlations coefficients exceed the minimal standard values.[36,39,41,45,50–53] Responsiveness to change was demonstrated for the FSS in the original paper using a small sample of patients with MS and Lyme disease.[35] Sensitivity to change with time and treatment has also been found by various other studies, although in some clinical trials other fatigue measures detected significant changes while the FSS did not.[59,64–66] Minimal clinically important difference (MCID) for the FSS was estimated to be 0.6 (95% CI 0.3–0.9) points in systemic lupus erythematosus,[67] with standardized MCID values of the FSS (0.41) being similar to that of the Vitality Scale of the MOS-SF-36 (0.44) and the Multidimensional Assessment of Fatigue (MAF) (0.45), but lower than for the MFI (0.59) and the FACIT-F (0.5). In rheumatoid arthritis (RA), the standardized MCID of the FSS was roughly similar to those of six other fatigue measures, and a 10 to 15% change in FSS was suggested to be clinically meaningful.[43]

Psychometric properties in PD generally resemble those in non-PD populations. In a PD sample comprising non-demented patients with Hoehn and Yahr (H&Y) stages ranging from I to V, missing item responses were 0.8% and data were fully computable in 95.8% of subjects.[55] Floor- and ceiling-effects were minimal (2.5%).[54] These data support the appropriateness of the FSS in PD. The FSS discriminates PD from healthy controls[38,68] and severe coxarthrosis,[68] and correctly, but to a lesser extent than the FACIT-F, discriminates between PD patients classified as nonfatigued and fatigued as measured by the Energy

subscale of the Nottingham Health Profile (NHP-EN).[4,54] Construct validity of the FSS in PD is further supported by moderate to strong correlations with other fatigue measures, such as the FACIT-F ($r = -0.77$),[54] the NHP-EN ($r = 0.62$),[54] the PFS ($r = 0.84$),[38] and a one-question fatigue rating ($r = 0.80$).[38] Low correlations were observed between the FSS and quality of life measures (PDQ-39:$r = 0.22$–$0.47$; MOS-SF-36: $r = 0.37$)[7,69] as well as the clinician-rated Hamilton Depression Rating Scale (HAM-D) ($r = 0.19$).[70] Correlations for PD between the FSS and reduced physical activity and function but not dopamine transporter density.[71] Although Rasch analysis identified FSS-item 1 as not meeting unidimensionality criteria, exploratory factor analysis resulted in one factor, supporting the unidimensionality of the FSS in PD.[54] Potential differential item functioning (DIF) by age was found for items 1 and 8 using *t* tests, but this difference did not remain significant after Bonferroni correction for multiple comparisons.[54] The FSS demonstrates excellent reliability with a Cronbach's alpha value of 0.94 found in two independent studies, and a split half reliability of 0.86 and 0.91.[39,55] Observed interitem correlations in PD range from 0.27 to 0.78.[38] Intraclass correlation and the MCID have not been assessed in PD. However, two clinical trials suggest the FSS to be responsive to change with time and treatment in PD.[11,70] Cohen's effect size for the reduction in FSS score was 0.79 in one of these studies, compared to 0.62 for the reduction in MFI score.[11]

### Final Assessment

The FSS fulfils the criteria of a "recommended" fatigue scale in PD (both for screening and severity rating) because it has been shown to have good psychometric properties (including discrimination between fatigued and non-fatigued patients) in non-PD and PD patients and has been used by groups other than the developers. Strengths of the FSS include its brevity and ease of administration. In addition, it has been translated to and validated in various languages and shows good psychometric properties in non-PD disorders as well as PD. However, the FSS does not provide a definition of the underlying variable it intends to measure. Few studies have assessed its psychometric properties in PD and the extent to which the scale items overlap with self-rated mood symptoms in PD has not been explored. Responsiveness in terms of MCID remains to be determined in PD, although sensitivity to change has been demonstrated in two clinical trials. Given its brevity and widespread use as generic fatigue measure, the FSS is well-suited to use in the clinic as screening tool and in large scale studies.

## The Fatigue Assessment Inventory

### Scale Description

The FAI is an expanded version of the FSS but unlike the FAI does include a definition of fatigue.[19] This self-administered multidimensional fatigue rating scale was developed to allow the assessment of fatigue symptomatology across various medical conditions. The 29 items included in the FAI are statements related to fatigue which are rated on a seven-grade Likert scale. As in the FSS, only the respective ends of the scale are defined ("completely disagree" = 1 to "completely agree" = 7). The FAI comprises four subscales measuring global severity (11 items of which 8 from the FSS), situation-specificity (6 items), consequences (3 items), and responsiveness to rest/sleep (2 items) of fatigue, and additional 7 items which are not part of these subscales. Subscales and the total FAI scores are calculated by averaging the included item responses, providing a score range from 1 to 7. Higher FAI scores indicate more severe fatigue. Although not explicitly recommended in the original paper, a cut-off of 4 is frequently used for diagnostic screening of the presence of fatigue. The explored time frame is the past 2 weeks.[22] The psychometric properties of the FAI were originally validated in a sample of patients with a variety of diagnoses including MS, SLE, Lyme disease, chronic fatigue syndrome, and dysthymia.[22] The FAI has since been applied in various other conditions.[29,72–83] The scale is copyrighted but freely available from its developers. The FAI provides instructions to the user and an explicit definition of fatigue.[22]

### Psychometric Properties

In non-PD disorders, the FAI possesses acceptable data quality, with low floor- and ceiling-effects,[78] although missing item responses of up to 17% have been reported.[55] Internal consistency of the FAI subscales is good to excellent, with Cronbach's alpha ranging from 0.70 (consequences of fatigue) to 0.93 (fatigue severity).[76,79,84] Interfactor correlations are low to moderate.[84] Test–retest correlations in patients with MS were found low for the "responsiveness to rest/sleep" subscale ($r = 0.29$) and ranged from poor to borderline ($r = 0.51$–$0.69$).[84] The FAI is able to distinguish between several different diagnoses as well as diseased and nondiseased subjects, although some studies found no differences between healthy controls and

patient groups in one or more subscales.[55,72,74,76,84] As expected, high correlations between the FAI fatigue severity subscale and the FSS have been reported (r = 0.98), indicating appropriate convergent validity for this subscale.[84] Convergent correlations with other measures of fatigue[79,82,84] and divergent correlations with measures of energy[84] are usually found to be moderate. The MCID of the FAI subscales and total FAI have not been determined. However, sensitivity to change with time and treatment for the total FAI and the FAI fatigue severity subscale has been demonstrated in clinical trials and observational longitudinal studies.[72,83,85]

In PD, a slightly modified version of the FAI (one additional item: "During the past week, I have slept very well") has been applied and partly validated.[13,29,80,81] Analysis of the acceptability of the FAI in PD has not been performed. Face validity appears acceptable, although the appropriateness of some situation-specific items for PD is uncertain. Principal components analysis of the modified FAI resulted in nine factors. Cronbach's alpha for these nine factors ranged from 0.27 to 1,[80] but Cronbach's alpha for the FAI subscales were not provided, and other analyses of reliability were not performed. FAI total scores discriminate significantly between PD patients and controls.[13,29] Convergent validity with other fatigue scales has not been studied in PD. Low to moderate negative correlations (r = −0.68) with a visual analogue energy scale and positive correlations with depression scores (r = 0.62) have been found.[13,29,80] No correlation was found between the FAI total score and clinical measures of motor performance and disease severity in PD.[29] One study found significant differences in FAI total score between PD patients with normal versus reduced perfusion in the frontal lobe as measured by SPECT.[29] The MCID of the FAI has not been determined in PD. However, in a 5-week open clinical trial, total FAI scores significantly decreased in PD patients on pergolide mesilate (5.1–4.4) but not in those receiving bromocriptine (4.8–4.7).[13]

### Final Assessment

The (modified) FAI fulfills criteria for a "suggested" fatigue scale in PD for both diagnostic screening and severity of fatigue. The FAI is a comprehensive instrument that covers various aspects of fatigue and allows comparison between different disease groups. An explicit definition of "fatigue" and clear instructions are provided. Items are brief and easily understandable. However, there are insufficient data to support its validity (including discriminant) and reliability in PD. The FAI shows generally acceptable psychometric properties in non-PD disorders, although test–retest reliability is only moderate and the MCID is unknown. Because of its overall length, the FAI appears less suitable for screening purposes and large scale studies. Of note, in prior critiques in this Task Force series, where psychometric properties could be established in non-PD populations and still meet the psychometric criterion, this scale would have met Recommended status.

## Functional Assessment of Chronic Illness Therapy-Fatigue Scale

### Scale Description

The Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-F) scale was developed from interviews with oncology patients and clinical experts to assess anemia-associated fatigue.[86] It is a patient-reported rating scale consisting of 13 items (statements) with five ordered response categories ("not at all" – "a little bit" – "somewhat" – "quite a bit" – "very much") regarding the respondents' situation during the past week.[86,87] It yields a summed total score ranging between 0 and 52 (52 = less fatigue). Item contents cover the experience (e.g., feelings of tiredness, listlessness, energy) as well as the impact (e.g., trouble doing things, need to sleep, social limitations) of fatigue but does not provide a definition of fatigue. It has been used and validated in a range of patient groups, such as RA, PD, various forms of cancer, and in the general population.[54,88–90] FACIT-F is one of the most widely used fatigue scales today,[91] and it is available in 48 official language versions (www.facit.org) that have been produced according to rigorous standardized methodology.[92,93] Although typically used as a traditional paper-and-pencil rating scale, the FACIT-F can be administered via a range of modes (e.g., interview and touch-screen computers).[94] General population norms are available for the United States.[90] The FACIT-F is part of the larger FACIT measurement system[95] and is copyrighted but freely available from its developers (www.facit.org). A manual and scoring algorithm is also available (www.facit.org).

### Psychometric Properties

Studies in non-PD populations conducted by its developers as well as by independent investigators[86,87,89,90,96–98] have found the FACIT-F to yield good data quality and reliability (coefficient alpha,

0.86–0.95; test–retest, 0.89–0.90) with a standard error of measurement (SEM) of about 2.3 to 4.3. Internal validity of the scale has been found adequate with mean interitem correlations of 0.51, corrected item-total correlations >0.4, and identification of a single dimension in factor analysis.[90,97,98] Construct validity has been supported by expected (−0.68 to −0.88) correlations with other fatigue related scales.[89,97,98] Divergent validity has been supported by an inverse correlation (0.61) with the POMS vigor scale. Further supporting its validity is its ability to discriminate between people with various hemoglobin and performance levels.[86,96–99] Comparisons with other fatigue scales have found the FACIT-F equally or more able to distinguish between such subgroups, and it has been found to represent a broader range of fatigue severity levels than, e.g. the Vitality (VT) scale of the SF-36 and the MAF.[89,97] One study found some DIF between cancer patients and the general population for three FACIT-F items.[100] However, it is unclear whether this influenced the total score. The FACIT-F has been used as an outcome measure in many clinical trials.[89,96,101,102] These studies have supported its responsiveness, showing effect sizes in the magnitude of about 0.5 to >0.8. These data have enabled guidance to be developed to aid interpretation of FACIT-F scores and planning of interventional trials.[87] Studies have identified a MCID and change score of about 3 to 4, corresponding to about 1 SEM, 0.5 standard deviation, and an effect size >0.2.[87,89,96,103] However, the MCID appears to be larger among people in palliative cancer care.[102] Different cut-off scores have been suggested. Van Belle et al.[98] proposed a score of 34 as a cut-off for diagnosing cancer-related fatigue. Based on general population and clinical trial data, others have suggested a FACIT-F score of 30 as a cut-off for significant fatigue.[87] This corresponds to fatigue scores associated with troublesome levels of activity limitations.[104]

The measurement properties of the FACIT-F in PD resemble those in non-PD populations.[54] The scale has been easy to use with good data quality (<1% missing item responses). Reliability has been good (test–retest reliability, 0.85; coefficient alpha, 0.90–0.92), with a SEM of 3.13. Floor- and ceiling-effects (1.7% and 0%, respectively) were well within the recommended threshold of <15%.[105] Construct validity was supported by expected correlations with scores on the FSS and the Nottingham Health Profile-energy scale (NHP-EN) (−0.77 and −0.70). In a different study,[106] FACIT-F scores correlated strongly (−0.89) with scores on the Parkinson Fatigue Scale. FACIT-F scores discriminated between fatigued and nonfatigued PD patients.[54] The relative efficacy of the FACIT-F and the FSS suggested that the former was about 50% more efficient in detecting differences than the latter. Explorative factor analysis and Rasch analysis provided support for the unidimensionality of the scale. Rasch analysis also suggested that the response categories work as expected and that there is no DIF between genders or older and younger respondents.[54] That is, items work the same way and have the same meaning across these subgroups.

There is no evidence regarding the responsiveness or MCID of FACIT-F scores in PD. However, the MCID found in non-PD studies is in general agreement with the SEM found in PD.[54] The resemblance between its SEM and MCID in non-PD populations[87,89,96,103] could therefore suggest that an MCID of about 4 FACIT-F points may apply also to PD.[107] Empirical data are, however, needed to confirm or reject this.

### Final Assessment

The FACIT-F fulfills criteria for a recommended scale for screening and suggested scale for severity rating. It does not achieve the status of "recommended" for severity because it has not been shown to be sensitive to change in PD. It is brief and has very good psychometric properties, including evidence for good reliability, internal and external validity in PD. It compares well to other fatigue scales both in PD and non-PD populations. Interpretation guidelines that relate changes and differences in scores to tangible clinical criteria are available in non-PD populations. It is available in a large range of languages, and all translations have been produced in association with the developers of the scale using rigorous methodology. However, there is no clearly stated definition of the underlying variable that it intends to measure. Replication studies are needed to more firmly establish its measurement properties in PD, including evaluations of responsiveness and MCID, which currently is lacking although available observations indicate better measurement precision than the FSS, thus suggesting it should be responsive. There are no data available on DIF across different patient populations or languages.

## The Multidimensional Fatigue Inventory

### Scale Description

The MFI is a 20-item self-report measure with five dimensions: general fatigue (GF), PF, MF, RM, and reduced activity.[108] Each dimension contains four items, with two items formulated in a positive and two

formulated in a negative direction. There are five response options. Items indicative of fatigue must be recoded before adding up after which higher scores indicate a higher degree of fatigue. Scores range from 4 to 20 for subscales. If one score is required, the GF scale is recommended.[108] The addressed time frame is "lately." The MFI has been used in >150 studies, including 14 studies in patients with PD. The scale is available in 15 languages. Population-based norm values for healthy populations are available.[109] The scale can be used free of charge for academic use on the condition that the original publication is properly referenced.

### Psychometric Properties

The acceptability of the MFI is generally good,[108,110] and the scale does not suffer from floor- or ceiling-effects.[111] The five dimensions of the MFI were postulated in advance and subsequently tested using confirmatory factor analysis. The fit indices in the original publication were good and retesting by the developers in a different sample confirmed the factor structure.[108,112] Other studies, however, sometimes found different factor solutions.[110,113–115]

Validity has been extensively evaluated in both PD and non-PD populations. In non-PD populations, all scales discriminated significantly between diseased and nondiseased and between fatigued and nonfatigued subjects.[108,111] Correlations of MFI subscales with other fatigue scales were generally moderate to high.[108,109,113,114,116–120] Correlations with scales measuring partly related constructs generally ranged from 0.40 to 0.60 for mood scales and from 0.45 to 0.67 for quality-of-life scales.[109,121] Correlations with hemoglobin values in different patient groups ranged from $-0.05$ to $-0.34$.[111,122]

The validity of the MFI in PD has been demonstrated in several studies. PD patients exhibited higher scores in all subscales compared to various control groups.[23,123,124] Convergent validity with other fatigue scales has been established with the FSI, POMS fatigue scale, VAS-energy, VAS-fatigue (VAS-f), D-FIS, and Global Perception of Fatigue.[6,23] Significant correlations have been established with several depression scales,[4,6,23,124,125] and with the PDQ-8 and PDQ-39.[6,126]

The reliability of the MFI has only been evaluated in non-PD populations. Cronbach's alpha for the five scales in clinical populations ranged from 0.76 to 0.93 in the original publication.[108] In most independent studies, satisfactory results were also obtained, with values usually well above 0.7 for subscales and above 0.9 for the total score,[110] although values <0.70 have occasionally been reported.[113,114,117] The test–retest reliability of the MFI was tested in various patient groups and generally was good, with intraclass correlation coefficients and test–retest correlations ranging from 0.50 to 0.85.[110,113,115,121,127] Neither internal consistency nor test–retest reliability have been assessed in PD.

Responsiveness of the MFI in non-PD populations has been demonstrated, with Cohen's effect sizes of the subscales in different patient groups ranging from 0.16 to 1.55.[111,115,121] A significant decrease in MFI score was found in patients indicating an improvement of >2 cm on a VAS-f over a 1 month period.[110] No data have been reported for the MCID. Responsiveness of the MFI in PD was assessed in only one randomized controlled trial where the MFI total scale decreased significantly, showing a Cohen's effect size of 0.63, which was somewhat smaller than the 0.79 that was found for the FSS.[11]

### Final Assessment

The MFI fulfils the criteria for a suggested scale for screening (as discrimination between fatigued and nonfatigued PD patients has not been demonstrated) and a recommended scale for severity rating. Its strengths are that it is a short scale with good psychometric properties, validity has been demonstrated in both PD and non-PD populations, reliability in non-PD is good. The scale has shown to be sensitive to change outside of PD and in one study in PD. The MFI includes a subscale to measure MF. Weaknesses are that the proposed factor structure has not always been confirmed in independent studies and there are no data on the reliability of the scale in PD. The MFI does not define fatigue. There is no information on the MCID.

## Parkinson's Fatigue Scale

### Scale Description

The PFS is a 16-item patient-rated scale that was developed to assess a single construct reflecting the physical aspects of fatigue in patients with PD and to measure both the presence of fatigue and its impact on daily function.[21] The scale was developed for use in clinical practice and in research as a screen or to assess fatigue severity. Seven items tap the presence or absence of the subjective experience of fatigue, with an emphasis on the physical effects of fatigue, e.g., "I feel totally drained." Nine items address the impact of

fatigue on daily functioning and activities, including socialization and work, but not exercise specifically, "I get more tired than other people I know." Neither severity nor frequency of fatigue symptoms is specifically measured. Ratings are based on feelings and experiences over the prior 2 weeks. Although the scale was designed to exclude cognitive and emotional features of fatigue, some items assessing the impact of fatigue may reflect mood states, e.g., "Fatigue makes it difficult to cope..." or its effects on motivation. Original testing of the scale was in patients with parkinsonism identified through PD support groups, of whom the majority were expected to have idiopathic PD. Two additional studies assessed the psychometric properties of the scale, one in a PD sample (n = 50) relative to healthy controls (n = 16)[40] and the other in a Swedish sample using a translated version of the instrument.[107] The scale has not been used in non-PD patient samples.

The item response options range from 1 ("strongly disagree") to 5 ("strongly agree"). There are three scoring options. A total PFS score, the average item score across all 16 items, ranges from 1 to 5. A binary scoring method yields scores from 0 to 16, with positive scores for each item generated by "agree" and "strongly agree" responses. A third option, used in the subsequent study, calculates a total PFS score (range 16–80) based on the sum of scores for the 16 individual items. The PFS using the ordinal scale range of 16 to 80 has been validated and used more.[38] The scale, available in English only, can be obtained free of charge from its developer for academic use. It was translated into Swedish as part of a separate study.[106]

### Psychometric Properties

Psychometric assessment of the PFS yielded good data quality and reliability (Cronbach's $\alpha$ = 0.97–0.98; test–retest = 0.82 using the total score and 0.82 for the binary scoring method). Internal validity of the scale was adequate to high. Split-half analysis showing correlations 0.93 to 0.95 and internal consistencies of 0.90 to 0.97[21,40] Interitem correlations ranged from 0.44 to 0.87.[40] Confirmatory factor analyses replicated the single factor for the 16-item scale.[21] For individual PFS-16 items, test–retest reliability (Spearman R) ranged from 0.52 to 0.72 (mean 0.63 + 0.06) for actual scores. Using the binary scoring method, concordance rate (percentage of subjects rating the same on both occasions) was high (71.9–89.7%, mean 80.7% ± 5.2), and there was a moderate degree of agreement between subsequent administrations (Cohen's coefficient kappa range 0.41 to 0.70 (mean 0.55 ± 0.08).

Construct validity is supported by correlation with the FSS[84] (Pearson r = 0.84), the RFS[128] r = 0.68 to 0.78), and FACIT-F.[21,40,87,107] Divergent validity has not been assessed. The PFS discriminates people with parkinsonism with and without fatigue and PD patients from healthy controls[40] and the presence of clinically significant fatigue in people with parkinsonism. There are no data on responsiveness of the scale to treatment effects or on MCID.

### Final Assessment

The PFS fulfills criteria for a recommended scale for screening and suggested scale for severity rating as its responsiveness to change has not been evaluated in PD or other samples. The PFS is a brief and easily completed scale developed specifically for use in patients with PD but does not define fatigue. Whether it provides an advantage over generic fatigue scales is unclear. Its focus on physical aspects of fatigue potentially provides a measure of fatigue that can be regarded as independent of affective, sleep, and cognitive disturbances. The scale is easily scored when the binary approach is used. The scale has good psychometric properties and compares well to other non-PD specific fatigue scales used in PD samples. To that end, the unidimensional construct assessed by the scale is likely to serve as a valid measure of the subjective experience of physical aspects of fatigue in other patient populations. The main disadvantage of the PFS is that further studies are needed to evaluate its measurement properties in PD. In particular, there are no data on its overlap with mood and cognitive status or its application as a clinical outcome measure. Because fatigue is inherently multidimensional, with physical, emotional, cognitive, and social features, this scale may not adequately reflect clinically significant nonphysical aspects of fatigue. A disadvantage of the scale itself is that it is unsuitable for clinical use unless the binary scoring method is used.

## Fatigue Severity Inventory

### Scale Description

The FSI is a 33-item questionnaire,[23] modified from the 29-item FSS,[72] originally designed for measuring fatigue severity in patients with multiple sclerosis and systemic lupus erythematosus, adapted for PD. Items are statements related to fatigue perceptions scored from 1 (completely disagree) to 7 (completely agree).

Eight items are specifically related to PD. In the original study, the scale was used as having two parts: (1) general, for use on PD patients and control subjects; (2) specific, for use only on PD patients. It is a patient-based assessment and contains items related to physical, mental, and social aspects, although not grouped in explicit domains. A proportion of items may overlap the symptoms and complications of PD. It does not include a definition of fatigue.

### Psychometric Properties

Analysis of acceptability and reliability were not performed.[23] Face validity is acceptable (subjective judgement), although some statements may appear contradictory or may be confounded with PD manifestations. The convergent validity with the MFI was "statistically significant ($P < 0.001$)," but the coefficient value was not given. Correlation with other measures (Hoehn and Yahr Staging, depression, energy) was weak to moderate. To our knowledge, no more information about the attributes of this scale is available.

### Final Assessment

The FSI is "listed" as an instrument for screening and measuring fatigue severity in PD. The FSI covers a diversity of aspects related to fatigue, including factors influencing this symptom and impact of the fatigue on daily functioning, work, and social activities. The 1 to 7 scoring per item could furnish a sensitive measure, but this attribute has not been explored. In terms of weaknesses, the FSI has not been formally validated and most of its psychometric properties are unknown.

## The Fatigue Impact Scale for Daily Use

### Scale Description

The D-FIS[129] an adaptation of the Fatigue Impact Scale (FIS),[130] was specifically designed for daily administration. The D-FIS is a self-administered rating scale composed of 8 items, each one scoring with five options of response from 0 (no problem) to 4 (extreme problem). The total score is obtained from the sum of each item's ordinal score and, therefore, runs from 0 to 32. The higher the score, the greater the impact of fatigue. The explored time frame is "today."

The scale, designed to measure severity (impact) of fatigue on daily life, was initially tested in patients with a flu-like illness, a condition allowing changes in the fatigue state in a brief time span.[130] Two additional studies assessed the psychometric properties of the scale in PD and Multiple Sclerosis.[6,118] The use in chronic conditions, such as PD, may be appropriate for monitoring effects of medication (e.g., clinical trials with antifatigue drugs, side effects of treatments) and comorbidity.

### Psychometric Properties

Items included in the D-FIS were selected from the FIS pool of items using Rasch analysis. The 8 items of the D-FIS may be grouped in three subscales: Cognitive (4 items), Physical (3 items), and Psychosocial (1 item). It provides a definition of fatigue for the users. Statements and response options are clear and concise. Overlap with PD symptoms (psychomotor retardation, slowness or clarity of thinking, attention, and apathy) may be present in at least 6 of 8 items (75%). The scale has been successfully applied to PD patients in stages 1 to 4 of the Hoehn and Yahr classification, in the "on" state.[6] As the D-FIS is not specific for PD, it does not contain instructions or specific sections related to fluctuations.

It possesses excellent data quality, with 95.6% to 98.9% of data fully computable.[6,115] No floor- or ceiling-effect was found and other parameters of acceptability were satisfactory.[6,118] In PD, as in the other conditions studied, D-FIS reliability was satisfactory. Cronbach's alpha values higher than 0.90 and item homogeneity coefficient, item-total correlation, and the intraclass correlations coefficient (test–retest) was higher than the minimal standard values[6,118,129] Factor analysis identified a single factor explaining 69.5% of the variance.[6]

Criterion validity has not been assessed for PD. In "PD patients with fatigue," correlation with global self-assessments (VAS and global perception of FSS), was high ($r_S = 0.55–0.62$),[6] indicative of appropriate convergent validity. D-FIS scores were significantly different between PD patients grouped by severity of fatigue levels (discriminative validity).[6] The SEM was low (demonstrating of good precision).[6,118]

### Final Assessment

D-FIS is a listed scale for screening for fatigue (no cut-off value established) and suggested measure for daily assessment of fatigue severity in PD as it has not been used to assess change in fatigue in this disease. The D-FIS is a brief and comprehensive scale with satisfactory psychometric attributes, potentially useful for application in PD when daily assessment of fatigue is

needed or convenient. It includes a definition of fatigue. In contrast to other scales, it emphasizes the impact of fatigue rather than the perceived severity of fatigue symptoms. There have been few validation studies in PD, a setting in which overlapping of fatigue with some disease manifestations may be problematic. Responsiveness has not been determined in PD, albeit the precision level predicts an acceptable sensitivity to change.

### Visual Analogue Scales

#### Scale Description

A VAS can be used to measure any subjective phenomenon. Subjects are asked to put a mark on a straight line to estimate where they believe their perception of the sensation being measured belongs. The lines may be of any length, but most commonly 10 cm. Studies of VAS have shown that: length less than 10 cm is more subject to error variance[131]: horizontal lines are associated with a more uniform distribution of scores than vertical[132]; descriptions should be at each end and not below or above[133] and that right angle endpoints, rather than arrows or other markers, are "critical."[133,134]

VAS have been used to help validate other fatigue scales in PD.[6,80,81] The first publication using the VAS in fatigue[80] found a statistically significant correlation ($P < 0.01$) between the VAS and six of the nine principal components identified in a principal components analysis of the same subjects completing the FAI.[80] The mean score of the subjects on the VAS was 53.74 (sigma 25.89) versus controls of 73.59 (sigma 21.91), $P < 0.001$. The VAS was used in one PD study measuring fatigue as a secondary outcome variable.[135] No data other than the mean scores were published. Data on convergent validity with other fatigue scales, depression, and PD measures were obtained in the D-FIS study.[6]

#### Final Assessment

VAS scales are classed as listed instruments for the assessment of fatigue in PD. VAS are easy to use and generally easy for the subject to understand. The scales can be used to measure virtually any self perception with a simple change in labels on the ends of the scale. Weaknesses are that VAS for assessment of fatigue in PD has not been validated. In addition, VAS test–retest reliability in PD should be investigated as motor or visual spatial deficits might affect accurate placement of the mark.

### Clinical Global Impression Scale

#### Scale Description

The CGIS, has, in some form, probably been used from time immemorial, for studies of all types. It is a scale that embraces all aspects of the condition under investigation and attaches a number to rate severity. Probably, the most commonly used form in psychiatric publications is a clinician-rated seven point scale[136] codified to assess severity of mental illness in which 0 = not assessed; 1 = normal; 2 = borderline mentally ill; 3 = mildly ill; 4 = moderately ill; 5 = markedly ill; 6 = severely ill; 7 = among the most extremely ill. The choice of seven options (0 not really being a rating) reflects analyses showing that seven options are "ideal."[137–139]

The CGISs, with scoring possibilities of 5, 7, and 11 choices, have been used in PD fatigue studies, but no psychometric data are available. For the 5-point scale, data on convergent validity with other fatigue scales, depression, and PD measures were obtained in the D-FIS study.[6]

The CGIS has been used in one long-term study[4,140] as a screen for fatigue and not for measurement. Van Hilten et al.[141] and Martinez-Martin et al.[6] measured fatigue with a 5 point scale but no psychometric data were provided. The Rhoten Scale,[130] used primarily in cancer, is another CGIS that was used only in a single publication in PD[21] to help validate the PFS.

#### Final Assessment

The CGIS is classed as a listed scale according to MDS criteria. The CGIS is easy to use and has been widely used in many medical and psychiatric disorders. Patients are familiar with the scale format in the ordinary context of their lives in rating likes and dislikes. On the negative side, there are few data on its value in fatigue and consensus is lacking regarding the number of choices that should be included in a CGIS. Supporting information for each fatigue instrument may be found in the online version of this article.

## CONCLUSIONS AND RECOMMENDATIONS

This systematic review has determined that two scales meet criteria for the designation of "recommended" as defined by the MDS for rating fatigue severity. These are the MFI and the FSS. Their relative strengths and weaknesses are outlined in Table 1 and detailed in the pro forma critique of each scale published on line. Treatment trials that use these scales will provide a better idea of their utility. The two

**TABLE 1.** *Fatigue Rating Scales review*

| Scale name | # Items | Time required estimated | Definition of fatigue provided | Time frame* | Problems | No of points for severity rating | Endorsement for severity rating | Endorsement for screening |
|---|---|---|---|---|---|---|---|---|
| FAI | 29 | 10–30 | yes | 2 wk | Lengthy | 7 | Suggested | Suggested |
| FSS | 9 | 5 | No | 2 wk | None | 7 | Recommended | Recommended |
| FACIT-F | 13 | 5 | No | 1 wk | None | 5 | Suggested | Recommended |
| MFI | 20 | 10–20 | No | "Lately" | Length | 5 | Recommended | Suggested |
| PFS | 16 | 15 | No | 2 wk | Requires binary format | 2 or 5 | Suggested | Recommended |
| D-FIS | 8 | 5 | Yes | Today | None | 5 | Suggested | Listed |
| FSI | 33 | 20–30 | No | Not stated | Length; lack of validation | 7 | Listed | Listed |
| VAS | 1 | 1 | Variable[a] | Variable[a] | Lack of validation | Continuous | Listed | Listed |
| CGI | 1 | 1 | Variable[a] | Variable[a] | Lack of validation | Variable | Listed | Listed |

*Time frame = time frame in which fatigue is assessed; time required = for testing, in min.

[a]The CGI and VAS are not standardized; therefore, fatigue may be defined or not and study interval also may be defined arbitrarily within each study.

Note that while "recommended" connotes a higher level of endorsement, in most of the above scales, the lack of this designation is due to lack of data on sensitivity to change in PD.

recommended scales have been widely used in studies on fatigue across a variety of medical conditions.

Three scales meet criteria for the designation of "recommended" for screening purposes, and these are the FSS, FACIT-F, and the PFS.

### Is There a Need for a PD-Specific Scale?

The question of whether a PD-specific scale is better than a generic scale was discussed. It was the committee's general opinion that the items in the one PD specific scale, the PFS, were not so different from the nonspecific scales that it provides clear advantages based on available data. It is possible, however, that specific features of PD warrant use of a PD-specific scale. For example, only the FSI addressed the evaluation of fatigue in relationship to motor fluctuations. Given that PD is characterized by progressive cognitive dysfunction and high rates of depression and anxiety, it would be useful to know whether the PFS serves as a more sensitive and specific instrument for tracking fatigue longitudinally in clinical trials and clinical care since the items focus on PF. As of this writing, however, we have no reason to think that central PF in PD is different than fatigue in other neuropsychiatric syndromes. In addition, there are more data available for assessing the non-PD-specific fatigue scales simply because they have been more widely used than the PFS. Generic scales also permit comparisons between fatigue in PD versus other behavioral disorders, which may improve our understanding of fatigue in general.

### Issues Related to Overlap of Fatigue With Other Motor and NonMotor Aspects of PD

It is impossible to distinguish the fatigue one experiences from PD from the fatigue that may be associated with concurrent depression, anxiety, cognitive dysfunction, apathy, medications, or other medical and psychiatric conditions. For the purpose of clinical studies and clinical care, an issue is whether a scale can elicit unique information about the presence, severity, or impact of fatigue relative to its correlation with other phenomena. This is relevant for trials on specific treatments for fatigue as well as when fatigue is included as a secondary outcome measure. It is possible that fatigue may be responsive to treatment of another condition, such as motor deficits or a mood disturbance. In the reviewed studies, depression symptom rating scale cut-off scores were typically used to exclude patients who were more likely to have a depressive disorder[4] and to examine correlations between fatigue and depressive symptoms.

In the case of depressive disorders in which fatigue is one of the supporting diagnostic criteria,[26] the links are inextricable. An "inclusive" approach to symptom assessment was recommended by the NIH task force on diagnostic criteria for depressive disorders in PD and may be similarly suitable for the evaluation of fatigue.[142] "Inclusive" ratings are based on the overt manifestations of symptoms regardless of whether those symptoms might be accounted for by a concurrent condition. Although the committee recommends an inclusive approach to symptom assessment where fatigue is concerned, the MDS-UPDRS fatigue item, which is self-rated, asks respondents to rate fatigue that is "not part of being sleepy or sad."[15] As the fatigue scales are self-rated, it is unclear whether patients can establish such differences reliably.

### Issues Related to Scale Properties

There has been no determination of how long a period should be sampled when assessing fatigue, so that

the D-FIS measures fatigue on a single day, whereas other scales typically use 2 weeks, or do not specify. Some of the scales have been validated in more than one language and culture, but not all, limiting their utility in a symptom that may have significant cultural biases. The FSS, FAI, FACIT-F, and the PFS all have been used for screening for the presence of fatigue, whereas the MFI and the FSI have been used only to measure fatigue severity.

The scales do not assess fluctuations in fatigue during the day or correlations between fatigue and "on" or "off" status.

The advantages of uni- versus multidimensional scales are not clear from this review. The use of a multidimensional scale to measure MF as distinct from PF must be based on definitions distinguishing the two. Although there are clear definitions of PF and MF, the determination of whether a given symptom represents one type of fatigue or another is difficult. Thus, it may be impossible to measure them in a valid manner. The advantage of a multidimensional scale is that subscales can be combined to produce a single number assessing fatigue provided that it can be shown to represent a unidimensional higher order construct.

A problem the committee discussed was the responsiveness of a scale to change. To achieve the status of a "recommended" scale, the instrument must have shown responsiveness to change in PD in a published study. This restriction in use of the term "recommended" differs from that of the previously published MDS reviews of scales used to measure other behavioral aspects of PD. Thus, the lack of a "recommended" status for a scale in this review may be due to lack of published studies rather than a problem with the scale.

### Need for Additional Data on Fatigue Scales as Outcome Measures

The committee strongly believes that even when fatigue may not be treatment responsive, recognition of the fatigue and putting it into the context of being a very common and often debilitating aspect of PD is very helpful for most PD patients.

The following issues in the area of fatigue rating scales require further research:

1. Studies on the sensitivity and specificity of fatigue rating scales for detecting clinically significant fatigue in patients with PD as well as the ability of the scales to provide distinct measures of fatigue irrespective of concurrent depressive, anxiety, or cognitive symptoms.
2. To facilitate treatment studies of fatigue in patients with PD, there is a need for studies on the sensitivity to change and minimal clinically important differences of the various fatigue scales.
3. Studies on MF versus PF, to determine whether rating scales are more sensitive to PF versus MF.
4. To determine possible differences in the structure of fatigue in PD patients compared to other neuropsychiatric disorders.
5. To determine if there are quantitative measures or biomarkers that reflect fatigue presence or severity.

## CONCLUSIONS

The committee believes that the fatigue scales that have been recommended are adequate for studies of fatigue in PD. The current scales are all designed as measures of severity and are probably sensitive to change. However, the lack of data pertaining to sensitivity to change indicate that this psychometric attribute needs to be tested. At this time, we do not suggest developing a new scale for assessing fatigue in PD.

We ardently recommend more studies on the pathophysiology and treatment of fatigue.

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