Fatigue Assessments in Rheumatoid Arthritis: Comparative Performance of Visual Analog Scales and Longer Fatigue Questionnaires in 7760 Patients

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ABSTRACT. ***Objective.*** Fatigue has been recognized as an important domain in rheumatoid arthritis (RA) clinical trials and in patient care and outcome. However, lengthy fatigue questionnaires cannot be easily used in clinical care, and there are no data for the comparative performance of various short and long questionnaires. We compared a single-item visual analog scale (VAS) with 3 longer fatigue questionnaires, investigating 4 fatigues scales: the Multi-dimensional Assessment of Fatigue (MAF), the vitality scale from the Medical Outcomes Study Short Form 36 (SF-36), the Brief Fatigue Inventory (BFI), and the VAS.

Methods. Participants in a longitudinal outcome study of RA (N = 7760) completed the 4 questionnaires, and a subset of 5155 completed the same fatigue scales 6 months later.

Results. All questionnaires were highly correlated and were correlated at similar levels with clinical variables. The 3 longer questionnaires had slightly greater reliability in cross-sectional analyses, but the VAS was as good as or better than the longer questionnaires when sensitivity to change was considered.

Conclusion. The single item VAS performs as well as or better than longer scales in respect to sensitivity to change, and is at least as well correlated with clinical variables as longer scales. The VAS fatigue scale is suitable for routine use in clinical care, an advantage that is lacking for the other scales. These results do not indicate advantages for longer fatigue scales compared with the VAS. (J Rheumatol 2004;31:1896–902)

Key Indexing Terms:
FATIGUE FATIGUE QUESTIONNAIRES RHEUMATOID ARTHRITIS

Fatigue is an important symptom for all patients. The observation that anti-tumor necrosis factor agents (anti-TNF) were associated with improvements in fatigue[1] led to increased interest in a previously relatively neglected clinical domain[2]. One of the first formal studies of fatigue in rheumatoid arthritis (RA) was reported by Belza, *et al* in 1993 using the 16-item Multi-dimensional Assessment of Fatigue scale (MAF) that they developed in patients with RA[3]. In 1996, we reported on fatigue in RA clinic patients using a visual analog scale (VAS)[4]. With the observation that fatigue was important in clinical trials, as well as being important to patients, an emphasis was placed on the use of "validated" fatigue questionnaires in future studies. However, there are no true criteria for what constitutes a valid questionnaire and there have been no head-to-head comparisons of fatigue questionnaires in rheumatology.

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In addition to the issue of validity, there is also an important issue regarding questionnaire length. Regardless of the quality of questionnaires, longer questionnaires have a significant burden for patient and physician when used in clinical care, essentially precluding their use in the clinic. A VAS, by contrast, can be used anywhere, and allows this important domain to be assessed by clinicians.

In this study, we investigated 4 fatigues scales: Belza's MAF[3], the vitality scale from the Medical Outcomes Study Short Form 36 (SF-36)[5], the Brief Fatigue Inventory (BFI), and the VAS fatigue scale[4]. The aim of this study was to compare the scales using various measures of validity and reliability, and in particular to determine if a VAS scale may be used effectively in place of longer scales.

MATERIALS AND METHODS

Patient sample. Patients in this study were participants in the National Data Bank for Rheumatic Diseases (NDB) longitudinal study of RA outcomes. Patients are recruited from the practices of United States rheumatologists, and are followed with semiannual questionnaires, as described [6-9] . This report concerns 7760 patients with RA who completed a series of fatigue scales in January 2002, and a subset of 5155 of those patients who completed the same fatigue scales 6 months later in July 2002. The mean age of the 7760 patients was 61.3 (SD 12.5) years and 77.5% were women. RA had been present for a median duration of 12.3 years. The mean Health Assessment Questionnaire (HAQ) score was 1.1 (SD 0.72).

Demographic and disease status variables. NDB participants are asked to

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complete semiannual detailed 28-page questionnaires about all aspects of their illness. At each assessment, demographic variables are recorded including sex, age, ethnic origin, education level, current marital status, and medical history. Disease status and activity variables collected include the Stanford Health Assessment Questionnaire functional disability index (HAQ disability)[10,11], VAS for pain, global disease severity and fatigue scales[4], the Arthritis Impact Measurement Scales (AIMS) anxiety and depression scales[12,13], the Rheumatoid Arthritis Disease Activity Index (RADAI)[14-16], a 5-point satisfaction with health scale, and a VAS "feeling thermometer" from the EuroQol to measure health-related quality of life (QOL)[17,18]. For processing by electronic scanning, VAS were formatted into 21 small boxes that effectively constituted a VAS line. These 21 boxes represented a 0–10 scale that had 0.5 unit increments.

Fatigue questionnaires. We conducted a Medline search for fatigue scales that had been used in rheumatic diseases. In addition, we examined other fatigue scales not used in rheumatic diseases but that were of a length suitable for use in rheumatology settings. We evaluated 4 fatigue questionnaires that met our study criteria.

VAS fatigue. The VAS is a single-item scale. It measures the severity of the fatigue over the past week with the specific question, "We are interested in knowing about any problems that you may have been having with fatigue. How much of a problem has fatigue or tiredness been for you IN THE PAST WEEK? Place an X in the box below that best describes the severity of your fatigue on a scale of 0–10."

Brief Fatigue Inventory. The BFI is a 4-section, 10-item fatigue questionnaire. The first item asks if the respondent has been unusually fatigued during the last week, but this item is not included in the summary scores. The net 3 sections consist of single-item 11-point scales that measure aspects of fatigue severity, including "fatigue (weariness, tiredness)" (1) now, (2) "the usual level of fatigue during the past 24 hours," and (3) the "worst level of fatigue during the past 24 hours." The specific question is, "Throughout our lives, most of us have times when we feel very tired or fatigued. Have you felt unusually tired or fatigued in the past week?" The scales are anchored by the descriptors "No fatigue" and "As bad as you can imagine." In this study, we have taken the mean of these 3 sections (items) to form the BFI severity scale. In addition, the 6 items of general activity, walking ability, mood, normal work (includes both work outside the house and daily chores), relations with other people, and enjoyment of life form the 4th section and measure interference with activities by fatigue. The specific question for these items is "Please place an X in the one number that best describes how, during the past 24 HOURS, fatigue has interfered with your . . . ." These scales are anchored by the descriptors "Does not interfere" and "Completely interferes." In this study, we have taken the mean of these 6 items to form the BFI interference scale. The mean of scores of the 4 sections form the BFI total fatigue scale, a 0–10 scale. The BFI was developed for use in cancer patients at the University of Texas[19], and has been validated in a number of studies[20-24]. Factor analysis of the BFI in cancer patients has demonstrated a single factor[19].

Multidimensional Assessment of Fatigue scale. The MAF measures fatigue and the effect of fatigue on activities in 16 items. Three items measure fatigue severity: "To what degree have you experienced fatigue" (anchors: "Not at all" to "A great deal"); "How severe is the fatigue you have been experiencing" (anchors: "Mild" and "Severe"); "To what degree has fatigue caused you distress" (anchors: "No distress" and "A great deal of distress"). These items are scored on a 1–10 scale.

Eleven items measure "...to what degree has fatigue interfered with your ability to do the following activities." Activities include "household chores, cook, bathe or wash, dress, work, visit or socialize with friends or family, engage in sexual activity, engage in leisure and recreational activities, shop and do errands, walk, and exercise (other than walking)." These items are scored on a 1–10 scale. Respondents are asked not to rate the item if they do not do the activity for reasons other than fatigue.

One item is a time-based measure of fatigue. "Over the past week, how often have you been fatigued?" with categories of "Every day; Most, but not all days; Occasionally, but not most days; Hardly any days." Items are scored 4, 3, 2, 1, and then multiplied by 2.5.

One item measures change in fatigue: "To what degree has your fatigue changed during the past week? Increased; Stayed the same; Fatigue has gone up and down; Decreased." This item is not scored in any of the summary scales.

The MAF total score is the sum of the 3 intensity-based severity scales, the one time-based severity scale, and the mean of the scores of the intensity scales. This yields a score that can range from 2.5 to 50. The MAF total score and the MAF intensity scores are presented here rescaled to a scale of 0.125 to 10. Rescaling to 0.125 to 10 was employed in order to keep the original steps and, for compatibility with other scales, to maintain 10 as the highest score. The MAF (mean) interference score is presented on a 1 to 10 scale. The MAF was developed for use in RA patients[25,26] and has been used in RA studies[27]. The multidimensional design of the MAF has not been confirmed by factor analysis.

The SF-36 vitality scale represents 4 questions from the SF-36 questionnaire that may be considered to represent a time-based fatigue severity scale[5]. They include "How much of the time during the past week did you feel full of pep, did you have a lot of energy, did you feel worn out, and did you feel tired." Possible choices are: "All of the time, most of the time, a good bit of the time, a little of the time, and none of the time." Scales are reversed as required, and results are presented on a 0 to 100 scale. For compatibility with the other scales, the vitality scale has been reversed and rescaled to a 0 to 10 scale.

Statistical methods. Data were analyzed using Stata version 8.0[28]. Cross-sectional associations between fatigue scales and between fatigue scales and clinical variables were evaluated by Spearman correlations, canonical correlation, and Kendall's tau. As described and programmed by Newson, Kendall's tau provides multivariable comparisons between a "y" variable and a series of "x" variables[29], including bootstrapped confidence intervals. Tau, which is represented on a (–1) to (+) scale, can be interpreted in terms of percentage agreement in the sense that, for example, an increase in VAS fatigue (coefficient 0.25) is 25% more likely to be associated with an increase in pain than a decrease in pain.

To evaluate sensitivity to change, change over 6 months in each of the fatigue scales was compared with change in a series of clinical variables using Kendall's tau. Associations between change in fatigue scores and change in clinical variables were weak. This was expected, as there was no systematic treatment applied to the RA cohort. Therefore Kendall's tau should be considered as a comparative measure to aid in distinguishing one fatigue scale from another and not as a measure of the degree of difference that might be seen in a clinical trial.

Factor analysis was performed using varima rotation. Statistical significance was set at the 0.05 level.

RESULTS

Table 1 displays the correlations of the 4 fatigue questionnaires and their subscales with each other and with clinical variables. The 4 total fatigue scales were well correlated with each other, with correlation coefficients between 0.79 and 0.86. Overall, the 4 total fatigue scales were also similarly correlated with clinical variables, with Pearson correlation coefficients in the general range of 0.50 to 0.68. When the intensity and interference components were reviewed, similar general results are observed. These data indicate a general similarity among the scales.

Table 2 displays the scores of the 4 questionnaires. For comparability, the 4 scales have been rescaled to a 0–10 range except for the MAF, which has been rescaled to values between 1 and 10. The original MAF scaling is unusual,

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Table 1. Correlations of fatigue components with fatigue components and clinical variables (n = 7760).

Variable	MAF Total	MAF Intensity	MAF Interference	BFI Total	BFI Intensity	BFI Interference	SF-36 Vitality	VAS Fatigue
Fatigue scores								
MAF Total	1.00	0.94	0.75	0.86	0.84	0.82	0.79	0.80
MAF Intensity	0.94	1.00	0.61	0.81	0.81	0.76	0.75	0.78
MAF Interference	0.75	0.61	1.00	0.67	0.60	0.67	0.55	0.56
BFI Total	0.86	0.81	0.67	1.00	0.91	0.97	0.75	0.76
BFI Intensity	0.84	0.81	0.60	0.91	1.00	0.82	0.73	0.76
BFI Interference	0.82	0.76	0.67	0.97	0.82	1.00	0.72	0.72
Vitality	0.79	0.75	0.55	0.75	0.73	0.72	1.00	0.71
VAS fatigue	0.80	0.78	0.56	0.76	0.76	0.72	0.71	1.00
Clinical variables								
HAQ	0.50	0.48	0.50	0.55	0.49	0.55	0.52	0.54
SF-36 physical function	0.51	0.48	0.51	0.56	0.49	0.56	0.55	0.52
PCS	0.53	0.51	0.50	0.55	0.51	0.53	0.59	0.55
Pain	0.55	0.54	0.47	0.57	0.54	0.55	0.50	0.62
Patient global	0.57	0.55	0.48	0.60	0.55	0.60	0.57	0.61
Satisfaction	0.56	0.53	0.44	0.58	0.52	0.58	0.61	0.54
QOL	0.63	0.60	0.55	0.68	0.60	0.68	0.62	0.64
RADAI	0.62	0.60	0.52	0.63	0.60	0.61	0.57	0.65

MAF: Multidimensional Assessment of Fatigue; BFI: Brief Fatigue Inventory; Vitality: SF-36 vitality scale; VAS fatigue; fatigue as measured by a single-item visual analog scale; HAQ: Health Assessment Questionnaire; SF-36: Medical outcome study short form 36; PCS; SF-36 physical component scale; QOL: quality of life; RADAI: Rheumatoid Arthritis Disease Activity Index.

Table 2. Summary and components scores of the 4 fatigue scales.

Fatigue Scale	N	Mean	SD	SE	Minimum	Maximum	% at Floor	% at Ceiling
Total scores								
MAF total score (0.05–10)	7078	4.98	2.16	0.026	1	10.00	0.01	0.2
BFI total fatigue score (0–10)	7669	3.44	2.56	0.029	0	10.00	13.2	0.8
VAS fatigue (0–10)	7760	4.21	2.80	0.032	0	10.00	6.4	1.8
SF-36 vitality (0–10)	7760	5.50	2.33	0.026	0	10.00	0.4	3.4
Intensity scores								
MAF intensity (1–10)	7086	4.80	2.62	0.031	1	10.00	13.6	4.1
BFI intensity score (0–10)	7618	4.24	2.70	0.031	0	10.00	8.5	1.3
VAS fatigue (0–10)	7760	4.21	2.80	0.032	0	10.00	6.4	1.8
SF-36 vitality (0–10)	7760	5.50	2.33	0.026	0	10.00	0.4	3.4
Interference scores								
MAF interference (1–10)	6919	3.92	2.21	0.027	1	10.00	7.1	4.2
BFI interference score (0–10)	7669	3.11	2.63	0.030	0	10.00	10.7	1.1

and a zero score does not occur in the MAF. The SF-36 vitality score has been reversed so that a higher score represents more abnormality in all the questionnaires. As shown in Table 2, the VAS fatigue scale, the BFI intensity score, and the MAF intensity scores have similar values. The MAF intensity score is slightly higher owing to the lack of a 0 point. By contrast, the SF-36 vitality score is approximately one point higher. This difference is expected, as the vitality scale was designed with population distributions in mind. The total scores of the MAF and BFI, and the intensity (total) scores of the VAS and vitality scales differ slightly (Table 2 and Figure 1). The differences between the MAF and BFI reflect the scaling and weight given to the interference components. Figure 1 displays the distributional characteristics of the scales, showing similarities between VAS, MAF, and vitality. The distribution of the BFI shows more values in the mid and lower levels. The alpha reliability of the MAF, BFI, and vitality scales was 0.94, 0.98, and 0.89, respectively.

Among the purported advantage of the MAF and BFI scales is that they measure multiple domains (are multidimensional). We performed factor analysis on the BFI

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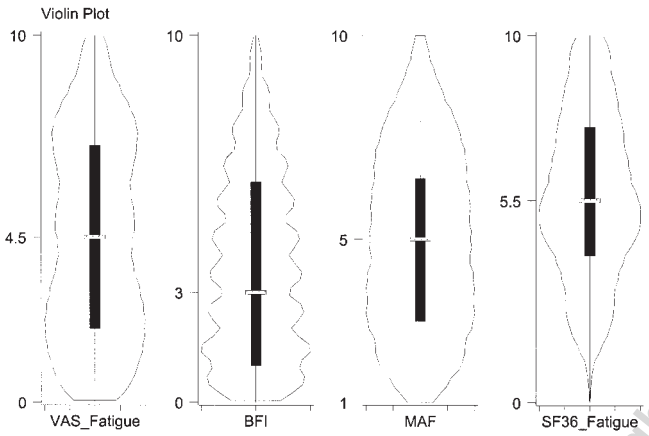

Figure 1. Violin plots show distributions of total fatigue scores for each fatigue questionnaire. Horizontal bar is at median.

items. A single factor-explained 94% of the variance; the eigenvalue for a second factor was 0.46. Three factors were identified for the MAF (Table 3). Factor 1 (eigenvalue 8.5) and factor 2 (eigenvalue 1.6) identified components of interference by fatigue with activities. The third factor (eigenvalue 1.0) represented fatigue severity and distress. These data indicate that only the MAF scale is multidimensional when all its components are considered together.

The 4 scales were net compared to each other at a clinical level in cross-sectional analyses. Canonical correlation (Table 4) of each scale with HAQ, pain, and patient global showed that the VAS, followed by the BFI, was better correlated with clinical status than the MAF and SF-36 vitality scales.

We assessed the comparative sensitivity to change of each fatigue scale by calculating Kendall's tau for the change in fatigue score and the change in clinical variables

Table 3. Factor analysis of MAF items.

Item	Factor 1	Factor 2	Factor 3
Interference with leisure	**0.76**	0.30	0.31
Interference with exercise	**0.75**	0.05	0.32
Interference with walking	**0.75**	0.28	0.28
Interference with shopping	**0.72**	0.44	0.30
Interference with sexual activities	**0.67**	0.07	0.31
Interference with chores	0.57	0.44	0.45
Interference with work	0.52	0.41	0.33
Interference with social visits	0.52	0.59	0.31
Interference with cooking	0.50	0.53	0.39
Fatigue — amount of time	0.28	0.10	**0.73**
Fatigue degree	0.27	0.16	**0.87**
Fatigue severity	0.26	0.18	**0.89**
Fatigue distress	0.25	0.23	**0.78**
Interference with bathing	0.17	**0.93**	0.14
Interference with dressing	0.15	**0.94**	0.12

MAF: Multi-dimentional Assessment of Fatigue.

Table 4. Canonical correlations of fatigue scales with HAQ, pain, and patient global severity. 95% CI are bootstrapped values.

Fatigue Scale	Canonical Correlation	95% CI	95% CI
VAS fatigue	0.69	0.68	0.70
BFI	0.66	0.65	0.68
MAF	0.63	0.62	0.65
SF-36 vitality	0.62	0.61	0.63

(Table 5). The VAS scale was more sensitive to change in pain and patient global compared with the other fatigue scales. Changes in HAQ, QOL, and Satisfaction did not differ among the 4 fatigue scales.

We found important problems with nonresponse in the MAF (Table 6). MAF scoring instructions ask patients not to respond to questions that refer to activities they do not do because of fatigue. This led to high rates of nonresponse for some items such as work (39.4%), sexual activity (33.1%), and exercise (23.7%). Overall, we had complete response for only 43.2% of patients (Table 7). As omitted activities may represent factors associated with illness rather than age or preference, we examined the relation between nonresponse to the MAF items and fatigue levels on the VAS fatigue scale (Figure 2). Increasing levels of nonresponse are associated with high levels of fatigue. This indicates that the MAF slightly underestimates fatigue levels. We were unable to score 9% of the MAF questionnaires due to excess nonresponse.

DISCUSSION

There is often a perception that longer scales and multidimensional scales are superior to shorter scales, particularly VAS scales. There are several reasons for this belief. Up to a point, and given good questions, longer scales are more reliable than shorter ones, as built-in redundancy reduces the

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Table 5. Kendall's tau in the comparison of 4 fatigue scales with clinical variables.

Variable	Coefficient	Z-Score	p	Lower 95% CI	Upper 95% CI
Pain difference					
VAS fatigue difference	0.20	17.14	< 0.001	0.18	0.22
MAF difference	0.14	12.07	< 0.001	0.12	0.17
BFI difference	0.12	10.38	< 0.001	0.10	0.14
SF-36 vitality difference	0.12	10.21	< 0.001	0.10	0.14
Patient global difference					
VAS fatigue difference	0.19	16.10	< 0.001	0.17	0.22
MAF difference	0.14	12.21	< 0.001	0.12	0.17
BFI difference	0.14	11.91	< 0.001	0.11	0.16
SF-36 vitality difference	0.12	10.60	< 0.001	0.10	0.15
HAQ difference					
VAS fatigue difference	0.12	10.69	< 0.001	0.10	0.15
MAF difference	0.13	10.97	< 0.001	0.10	0.15
BFI difference	0.12	10.58	< 0.001	0.10	0.14
SF-36 vitality difference	0.12	10.86	< 0.001	0.10	0.15
QOL difference					
VAS fatigue difference	–0.13	–11.05	< 0.001	–0.15	–0.10
MAF difference	–0.14	–12.13	< 0.001	–0.16	–0.12
BFI difference	–0.12	–9.94	< 0.001	–0.14	–0.09
SF-36 vitality difference	–0.14	–12.09	< 0.001	–0.16	–0.12
Satisfaction difference					
VAS fatigue difference	0.13	12.35	< 0.001	0.11	0.15
MAF difference	0.13	11.95	< 0.001	0.11	0.15
BFI difference	0.12	11.49	< 0.001	0.10	0.14
SF-36 vitality difference	0.16	14.77	< 0.001	0.14	0.18
RADAI difference					
VAS fatigue difference	0.20	17.58	< 0.001	0.18	0.23
MAF difference	0.18	15.28	< 0.001	0.16	0.21
BFI difference	0.16	13.18	< 0.001	0.13	0.18
SF-36 vitality difference	0.17	14.32	< 0.001	0.14	0.19

Table 6. Missing data in MAF scale.

Item — Scale	Answered	Not Answered	% Missing
MAF-interference with work	4699	3061	39.4
MAF-interference with sexual activity	5193	2567	33.1
MAF-interference with exercise	5920	1840	23.7
MAF-interference with cooking	6459	1301	16.8
MAF-interference with leisure activity	6690	1070	13.8
MAF-interference with household chores	6713	1047	13.5
MAF-interference with walking	6792	968	12.5
MAF-interference with shopping/errands	6965	795	10.2
MAF-interference with socialization	7056	704	9.1
MAF-interference with bathing/washing	7159	601	7.7
MAF-interference with dressing	7169	591	7.6
MAF-to what degree has fatigue caused distress	7060	700	9.0
MAF-how severe is fatigue that you have experienced	7086	674	8.7
MAF-over past week how often fatigued	7264	496	6.4
MAF-to what degree have you experienced fatigue	7726	34	0.4
MAF-to what degree has fatigue changed	7233	527	6.8

standard error of the method. In this study the alpha reliability of the MAF, BFI, and vitality scale was 0.94, 0.98, and 089, respectively; and the standard error, as expected, was slightly larger for the VAS scale than for the multi-element scales.

Even though the MAF, but not the BFI, was shown to

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Table 7. Percentage and number of patients with nonscored items on the MAF scale.

No. of Missing Items	No. of Patients	Scored, %	Not Scored, %
0	3039	43.2	43.2
1	1790	25.5	68.7
2	1124	16.0	84.7
3	534	7.6	92.3
4	250	3.6	95.8
5	130	1.9	97.7
6	69	1.0	98.7
7	44	0.6	99.3
8	22	0.3	99.6
9	16	0.2	99.8
10	12	0.2	100.0

be multidimensional by factor analysis (Table 3), all of the scales were unidimensional in their total scores, as the total scores represent a combining of several subscales. The MAF and the BFI could be split into interference and intensity components, but it does not appear that additional useful information comes from using the scales in their subcomponents, and in practice each scale is used with a single total score. In addition, the relatively lower correlations of MAF interference with other variables (Table 2) and the results of the factor analysis (Table 3) indicate that some items of the MAF interference scale do not examine the same dimension.

When examined for their associations with clinical variables (Table 1), all the scales performed similarly, although in multivariate analyses (Table 4) the VAS and BFI scales were superior to the other scales in their degree of association with clinical variables. One could conclude, based on the above data, that the 4 scales are generally similar, but that the longer scales are slightly more reliable. If a cross-sectional study were designed to measured differences in fatigue between 2 groups, the VAS would require a slightly larger sample size than the other scales.

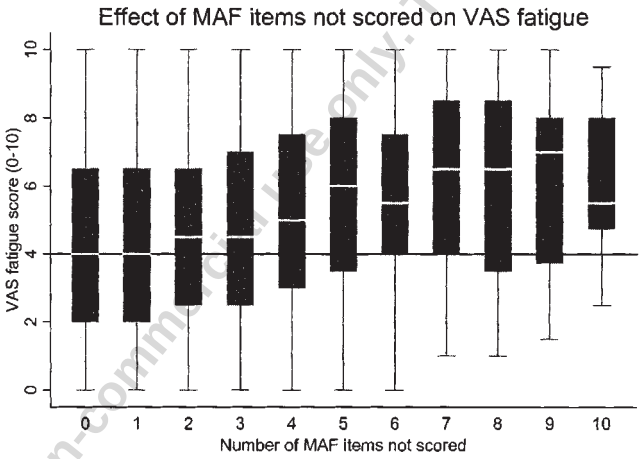

Figure 2. Increase in VAS fatigue score as a function of number of missing items for MAF "interference" questions. MAF: Multi-dimensional Assessment of Fatigue; VAS Fatigue: Fatigue measured by a single-item visual analog scale.

Despite the above data and interpretations, the usefulness of a "good" scale is far more dependent on sensitivity to change than to results of static parameters. Table 5 describes the association of 6-month change in fatigue with 6-month change in clinical variables. As shown in Table 5, for 2 of 5 important clinical variables, VAS fatigue is more strongly associated with clinical variables than the other fatigue scales; and for the 3 other clinical variables the VAS scale performs at least as well as the other fatigue scales. Although our results are based on observational data, they indicate that a VAS fatigue scale is likely to perform as well as or better in a clinical trial than the longer and more complicated scales studied here. Even so, these data should be viewed cautiously, as interventional studies and observational studies might possibly yield different results.

The VAS scale has another important advantage compared with longer scales in that it is suitable for use in the clinic. By contrast, longer scales, when used in the clinic in the context of other clinical assessments, take too much time to administer and score, and present unacceptable patient burdens. There is no true criterion of when a scale is valid. In the rheumatology literature, we have never seen a questionnaire or scale that was shown to be invalid, owing to a lack of criteria for validity and the fact that almost any scale that has a reasonable idea behind it will correlate with other measures: often the standard for validity. We would like to see far less emphasis on validity and much more emphasis on usefulness. All scales may be valid, but some are much more useful and valid than others.

We did not study the Functional Assessment of Chronic Illness Therapy Fatigue Subscale (FACIT-F) scale[30,31]. FACIT-F has been used in adalimumab clinical trials[1]. Unlike the MAF and BFI, it was developed using item-response theory and item banking to have good scaling and psychometric properties[30]. Although we have not formally studied this scale to date, examination of the FACIT-F questions and the methodology of its development suggest that it will have superior scaling properties. It remains to be seen, however, if it will perform as well as the VAS; and, as with the non-VAS scales in this study, its length will interfere with its use in the clinic. Although we have not formally studied the FACIT, preliminary data obtained in 2004 indicate that it is correlated with the VAS fatigue scale at r = 0.78, a level similar to that obtained with other scales (Table 1), and that the correlations with clinical variables are similar for the 2 scales.

We noted problems with nonresponse for the MAF. This led to the inability to score 9% of the questionnaires when more than 6 items were unanswered. Although this did not alter the ability of the MAF in comparison with other

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scales, it must be considered a limiting factor for use in clinical trials where response is required.

Fatigue is a complex phenomenon, encompassing aspects of mental and physical fatigue, tiredness, and fatigability. Vitality, perhaps thought of as energy and drive, is not simply the opposite of fatigue. In this study, however, we analyzed the SF-36 vitality scale as if it were simply an opposite, and despite the differences of the 2 concepts, we found virtually the same cross-sectional and longitudinal association, including associations with other RA variables. Therefore at a practical level there would seem to be little difference between fatigue and vitality scales.

In summary, the single-item visual analog scale performs as well as or better than longer scales (up to 16 items) in respect to sensitivity to change, and is at least as well correlated with clinical variables as longer scales. In cross-sectional analyses the VAS has slightly larger standard errors compared with longer scales. The VAS fatigue scale is suitable for routine use in clinical care, an advantage that is lacking for the other scales. The results of this study do not indicate advantages for longer fatigue scales compared with the VAS.

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