The validity and reliability of the Fatigue Severity Scale in Turkish multiple sclerosis patients

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The aims of this study were to investigate the Fatigue Severity Scale's Turkish version's validity, reproducibility, internal consistency and parameters. Multiple sclerosis patients' disability levels were determined by the Expended Disability Status Scale and depression status was established with the Beck Depression Inventory. The Fatigue Severity Scale and Beck Depression Inventory were administered through self-report methods and assistance, without guidance, given where needed. An interval of 1 week was allowed between the applications. Seventy-two definitely diagnosed multiple sclerosis patients and matched 76 healthy controls were included. The multiple sclerosis patients' median Expended Disability Status Scale score was 4.0 (1.0–9.5). There were statistically significant differences between multiple sclerosis patients' and healthy controls' Fatigue Severity Scale scores ($P < 0.001$). After controlling for depression, Fatigue Severity Scale scores were lowered, but there was still a significant difference between them ($P < 0.001$). There was no significant difference between the interviews for Fatigue Severity Scale$_1$ and Fatigue Severity Scale$_2$ ($P = 0.719$). Internal consistency for Fatigue Severity Scale was good for multiple sclerosis patients (ICC = 0.81, $P < 0.001$). Cronbach's α of Fatigue Severity Scale$_1$ was 0.89; Fatigue Severity Scale$_2$ was 0.94. Expended Disability Status Scale scores ($P < 0.05$) and Beck Depression Inventory scores ($P < 0.001$) have a significant effect on the Fatigue Severity Scale. In conclusion, scales have a great importance in following up and assessing the results of treatment strategies. The Turkish validation of the Fatigue Severity Scale is reliable and valid, and is an appropriate tool to assess fatigue in the Turkish multiple sclerosis population. *International Journal of Rehabilitation Research* 30:81–85 © 2007 Lippincott Williams & Wilkins.

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Introduction

Fatigue is a common symptom seen in 80% of the patients with multiple sclerosis (MS) and causes a decline in the quality of life of the patients by increasing disability severity. Fatigue caused by MS is a hard situation to define and can be examined in three different groups: subjective, motor and cognitive fatigue. Among these, subjective fatigue is the hardest one to describe and determine.

Some authors generally describe subjective fatigue as the state of exhaustion, which is quite different from physical fatigue, or depressive state. According to the description of the patients it is the feeling of exhaustion, dormancy, depression, lassitude and faintness (Sheean *et al.*, 1997; Schwid *et al.*, 1999). Fatigue is also seen in the healthy population. The factors that differentiate general fatigue from MS-related fatigue are: deterioration with heat, inhibition of physical activity, prevention of the fulfilling of personal role and responsibilities, rapid progression and its relation with the person's spiritual state (Krupp *et al.*, 1988; Bergamaschi *et al.*, 1997; Egner *et al.*, 2003; van der Werf *et al.*, 2003; Krupp, 2004).

MS-related fatigue could be divided into two groups: (1) acute fatigue, which can develop with a relapse and diminish and disappear with remission, and (2) chronic fatigue that can be consistent without remission.

It is harder to interpret MS-related fatigue than to describe it and for this purpose many scales have been developed in order to assess the fatigue from single or multiple angles. The main characteristic of these scales is that the patient picks the appropriate choice after reading a scale. The Fatigue Severity Scale (FSS) can be given as the best example of the unidimensional scales (Krupp *et al.*, 1988).

The FSS, developed by Krupp in 1989, is a self-reported scale that measures the severity of fatigue and is widely

used in multiple sclerosis patients. As the original scale is in English, validation of the Turkish version was necessary.

The aims of the study were to investigate the following factors: (1) the validity and reproducibility of the Turkish version of the FSS, (2) the internal consistency of the FSS, and (3) the parameters which may affect the FSS score.

Methods

The study group consisted of two neurologists, five physiotherapists, a psychometrics consultant and a statistician. The scores used in the scale were as follows: (1) strongly disagrees, (2) moderately disagrees, (3) mildly disagrees, (4) neither agrees nor disagrees, (5) mildly agrees, (6) moderately agrees, and (7) strongly agrees.

Instrument

The FSS, which was published in 1989 by Krupp, has nine items. For each question, the patient is asked to choose a number from 1 to 7 that indicates how much the patient agrees with each statement, where 1 indicates strong disagreement and 7 indicates strong agreement. A score of 4 or higher generally indicates severe fatigue.

The disability levels of the patients were determined according to the Expended Disability Status Scale (EDSS) before the FSS application (Kurtzke, 1983). In addition, the Beck Depression Inventory–Turkish Version (BDI) was given to the patients in order to determine their depressive mood. The BDI is an inventory that consists of 21 questions, and is concerned with the behavior and feelings that are related with the general depressive state (Hisli, 1988).

Translation

Two independent specialists, who had not seen the text before, initially translated the original scale from English to Turkish. Two other independent specialists, who also had not seen the text previously, back translated the text in Turkish to English. The original text in English and the back-translation to English were compared, and it was determined that there were no significant differences between the two tests.

Patients

The study was performed between May 2003 and May 2004. The patients were identified randomly from the patient records in the Hacettepe University Medical School Department of Neurology and Ankara Branch of the Turkish Multiple Sclerosis Association, and the volunteers were included in the study. Informed consent was obtained from patients before the study. The inclusion criteria were the diagnosis of MS according to

the Poser criteria (Poser, 1965), age over 18 years and being aware of the diagnosis. Patients who had a relapse 1 month before FSS application or who had another disease were excluded. The protocol was approved by the local ethics committee of the Hacettepe University Medical School.

Fatigue severity scale administration

A telephone call was used to ascertain the patients who are able to personally visit the clinic and those who would require a visit at home because of ambulation problems. The patient was informed by the physiotherapist regarding how to fill-in the questionnaire. In order to identify the patient's emotion and behavior with relation to their general depressive state, the BDI was given before FSS application. Patients who needed assistance due to a reading and/or writing problem were supported when necessary. During the administration of BDI and FSS any incomprehensible questions and answers were explained to the patients, but without giving any guidance as to the response they should give.

Statistical analysis

In order to determine the clinical validity of the FSS, the Student's t-test was used to determine the difference between the control group and MS patients with respect to total FSS scores. These results were interpreted with the effects of the BDI to investigate the divergent validity. Covariance analysis was used to examine the results after controlling the effects of depression of the FSS. The reproducibility and test–retest reliability of the scale was determined by the intraclass correlation coefficient (ICC) and paired t-test. The multitrait analysis approach was adopted to test whether conceptualization into domains fitted the data and whether the results of the Turkish questionnaire replicated the results obtained with the English language questionnaire in terms of internal consistency reliability (Cronbach's α).

In addition, the correlation between total FSS score and age, the duration of the disease, EDSS score and BDI score were examined by the Pearson correlation signal (two-tailed) test.

Results

The demographic and clinical characteristics of the MS patients and healthy subjects are given in Table 1. There was no statistically significant difference between the two groups in terms of age, gender and education status.

In both the first and second applications, FSS scores were statistically significant in the MS patients and healthy group ($P < 0.001$). These results have shown us that the scale was valid as regard to divergence. BDI results have shown that there was severe depression in MS patients ($P < 0.001$) (Table 2).

Table 1 Demographic and clinical characteristics of multiple sclerosis patients and a healthy control group

	Multiple sclerosis patients ($n=72$)	Control group ($n=76$)
Age, years, mean (SD)	38.16 (10.03)	3.33 (9.53)
Gender, *n* (%)		
Female	44 (61.1)	43 (56.6)
Male	28 (38.9)	33 (43.4)
Education status, *n* (%)		
Elementary school	10 (13.9)	10 (13.2)
Secondary school	6 (8.3)	6 (7.9)
High school	20 (27.8)	19 (25.0)
University	36 (50.0)	41 (53.9)
Marital status, *n* (%)		
Married	41 (56.9)	56 (73.7)
Single	25 (34.7)	20 (26.3)
Divorced	6 (8.3)	–
Duration of multiple sclerosis, years, mean (SD)	9.5 (6.43)	–
Expended Disability Status Scale, median (range)	4.0 (1.0–9.5)	–

Table 2 The validity of the Fatigue Severity Scale with the effects of depression

	Multiple sclerosis patients ($n=72$)	Control group ($n=76$)	*t*-value	*P*-value
	Mean ± SD	Mean ± SD		
Fatigue Severity Scale$_1$	4.81 ± 1.46	3.31 ± 1.38	6.40	<0.001
Beck Depression Inventory$_1$	12.24 ± 7.72	7.82 ± 8.47	3.31	<0.001
Fatigue Severity Scale$_2$	4.85 ± 1.60	3.13 ± 1.54	6.62	<0.001
Beck Depression Inventory$_2$	11.7 ± 8.54	5.97 ± 7.35	4.36	<0.001

Table 3 The validity of the Fatigue Severity Scale after controlling for depression

	Multiple sclerosis patients ($n=72$)	Control group ($n=76$)	*t*-value	*P*-value
	Mean ± SD	Mean ± SD		
Fatigue Severity Scale$_1$	4.64 ± 1.32	3.47 ± 1.32	5.31	<0.001
Fatigue Severity Scale$_2$	4.54 ± 1.39	3.42 ± 1.39	4.75	<0.001

Table 4 Internal consistency analysis of the Fatigue Severity Scale: Cronbach's α

	Multiple sclerosis patients ($n=72$)	Control group ($n=76$)
Fatigue Severity Scale$_1$	0.8899	0.8762
Fatigue Severity Scale$_2$	0.9401	0.9219

Since the BDI scores of the MS patients were very high when compared with healthy subjects, to examine the effects of depression the scores were investigated with covariance analysis. After controlling for depression, in both the first and second applications the FSS scores of the MS patients were significantly higher than the healthy subjects ($P < 0.001$) (Table 3).

Table 5 The relation of clinical parameters to the Fatigue Severity Scale in multiple sclerosis patients

	Fatigue Severity Scale$_1$ ($n=72$)		Fatigue Severity Scale$_2$ ($n=72$)	
	r	*P*	*r*	*P*
Age	0.26	0.028	0.22	0.063
Disease duration	0.23	0.050	0.17	0.152
Expended Disability Status Scale score	0.41	<0.001[***]	0.29	<0.05[*]
Beck Depression Inventory score	0.43	<0.001[***]	0.56	<0.001[***]

[*]$P<0.05$; [***]$P<0.001$, statistically significant.
Pearson correlation significant (two-tailed test).

Two different applications to MS patients 1 week apart did not result in any statistically significant changes in the results ($P = 0.719$). ICC values were 0.81 (99% confidence interval = 0.81) ($P = 0.719$).

The internal consistency of the FSS was relatively high, as shown in Table 4. When the results were investigated, it was observed that the FSS has a good internal consistency.

The correlation between FSS scores and the parameters that can influence FSS scores, such as age and the duration of disease, was statistically non-significant ($P > 0.001$). When the influence of depression was removed there was a weak correlation between EDSS and FSS ($P < 0.001$). There was a positive correlation between the FSS and BDI scores of MS patients ($P < 0.001$) (Table 5). Depression seems to be a factor which increases the severity of fatigue in MS patients.

Discussion
The FSS is the most frequently used scale among the unidimensional scales which have been developed to assess fatigue. It shows a moderately good correlation with the Visual Analog Scale, that would indicate that the FSS is a useful tool in assessing the severity of fatigue (Schwid, 2002). Language is, however, one of the most important problems experienced when similar scales were used. We have observed that the FSS had not been translated to other languages than English and not validated when the literature was examined. In our study, which was for the validation of the Turkish version, we found there was a statistically significant difference between MS patients and healthy subjects. According to the FSS, scores over 3 represent severe fatigue (Krupp, 2004).

When the fatigue status of MS patients was investigated without controlling for depression (divergent validity), FSS scores were over 4 and they had significant fatigue, while in healthy volunteers FSS scores were less then 4 (Table 2). Even when the influence of depression was

removed FSS scores tended to decrease to a certain extent; however, they were still higher than 4 and were statistically significant compared with the healthy group (Table 3). These findings indicate that the Turkish translation of the FSS is a sensitive and useful tool for the evaluation of fatigue.

In scales that measure the severity of a symptom, such as the FSS, it is important to perform the measurements with the same sensitivity after repeated applications. In the literature it has been mentioned that after 1 month, patients generally were not able to remember the test. MS is, however, a disease with relapses, and over a 1-month period there is a chance that the patient's health condition may have changed and, therefore, in the present study we repeated the tests 1 week apart. Kos et al. (2005) reported this period as 3 days in the study that they used the Modified Fatigue Impact Scale. There was no statistically significant difference between the two applications of the FSS 1 week apart in our study ($P = 0.719$). This result indicates that the FSS is a convenient tool to evaluate fatigue in repeated measures. When ICC values were investigated we realized that the FSS shows sufficient (near to high) reproducibility (0.81) (99% confidence interval = 0.81) ($P = 0.719$). When the literature was examined it was seen that the FSS's internal consistency value was 0.81 for MS patients and for the systemic lupus erythematosus patient group in the original study of Krupp et al. (1988). In addition, when the FSS was used for chronic hepatitis C patients the value was 0.94 (Kleinman et al., 2000). In our study, Cronbach's α values vary between 0.8899 and 0.9401, and indicate that the FSS in Turkish shows high internal consistency and homogeneity. In the literature it can be seen that the impact of various factors which may influence MS-related fatigue, such as age, disease duration, disability and depression, have been investigated in many studies.

Flachenecker et al. (2002) were not able to determine a relationship between age, disease duration and the severity of fatigue in 151 patients with MS. This result is in accordance with our present findings ($P > 0.05$). The findings concerning the effect of disability on the fatigue severity are contradictory. Bakshi et al. (2000) reported that there was no correlation between EDSS and FSS when the influence of depression was removed. On the other hand, moderate correlation was reported between EDSS and FSS in 71 MS patients by Kroencke et al. (2000) ($r = 0.33$).

Flachenecker et al. (2002) reported a significant correlation between EDSS and FSS ($r = 0.33$, $P < 0.0001$). In studies by Flachenecker et al. (2002) and Kroencke et al. (2000), the correlation between EDSS and FSS was investigated without removing the effects of depression (Bakshi et al., 2000; Kroencke et al., 2000; Flachenecker

et al., 2002). In the present study we have investigated the correlation of EDSS and FSS after the influence of depression was removed, and, as a result, have determined a moderate correlation in FSS_1 and a weak correlation in FSS_2. The decline in all these values, together with the weakening of this relationship in the second evaluation, seems to be as a result of the patient's capacity to remember the test.

It has been stated in many studies that depression accompanies fatigue in MS and has amplifies the severity of fatigue (Romani et al., 2004; Randolph and Arnett, 2005; Strober and Arnett, 2005). Our results also have shown that depression has a strong influence on fatigue (Table 5).

Conclusion
Scales have a great importance in following up the clinical progress of the patient and assessing the results of treatment strategies in all diseases, and especially in the progressive diseases. Although there are many scales in English, there are few studies validating these scales in other languages, including for the FSS. There was a need to follow-up the severity of fatigue in MS patients in Turkey through the use of the FSS by health professionals. As this scale was not available, the severity of fatigue was assessed only with the Visual Analogue Scale.

In this present study our aims were to translate the FSS into Turkish, and to measure the validation and reproducibility of the Turkish version. Following the study we have realized that the translation was clear enough and cultural adaptation was not necessary. Since the Turkish validation of the FSS is reliable and valid, it is clear that this scale is an appropriate tool to assess the fatigue of the Turkish MS population

References
Bakshi R, Shaikh ZA, Miletich RS, Czarnecki D, Dmochowski J, Henschel K, et al. (2000). Fatigue in multiple sclerosis and its relationship to depression and neurologic disability. Mult Scler 6:181–185.
Bergamaschi R, Romani A, Versino M, Poli R, Cosi V (1997). Clinical aspects of fatigue in multiple sclerosis. Funct Neurol 12:247–251.
Egner A, Phillips VL, Vora R, Wiggers E (2003). Depression, fatigue, and health-related quality of life among people with advanced multiple sclerosis: results from an exploratory telerehabilitation study. Neurorehabilitation 18:125–133.
Flachenecker P, Kumpfel T, Kallmann B, Gottschalk M, Grauer O, Rieckmann P, et al. (2002). Fatigue in multiple sclerosis: a comparison of different rating scales and correlation to clinical parameters. Mult Scler 8:523–526.
Hisli N (1988). A validation study of Beck Depression Inventory [in Turkish]. Turk J Psychol 6:118–126.

Kleinman L, Zodet MW, Hakim Z, Aledort J, Barker C, Chan K, *et al.* (2000). Psychometric evaluation of the fatigue severity scale for use in chronic hepatitis C. *Qua Life Res* **9**:499–508.

Kos D, Kerckhofs E, Carrea I, Verza R, Ramos M, Jansa J (2005). Evaluation of the modified fatigue impact scale in four different European countries. *Mult Scler* **11**:76–80.

Kroencke DC, Lynch SG, Deney DR (2000). Fatigue in multiple sclerosis: relationship to depression, disability, and disease pattern. *Mult Scler* **6**:131–136.

Krupp LB (2004). *Fatigue in multiple sclerosis: a guide to diagnosis and management*. New York: Demos.

Krupp LB, Alvarez LA, LaRocca NG, Scheinberg LC (1988). Fatigue in multiple sclerosis. *Arch Neurol* **45**:435–437.

Kurtzke JF (1983). Rating neurologic impairment in multiple sclerosis: an expanded disability status scale (EDSS). *Neurology* **33**:1444–1452.

Poser CM (1965). Clinical diagnostic criteria in epidemiological studies of multiple sclerosis. *Ann N Y Acad Sci* **31**:506–519.

Randolph JJ, Arnett PA (2005). Depression and fatigue in relapsing-remitting MS: the role of symptomatic variability. *Mult Scler* **11**:186–190.

Romani A, Bergamaschi R, Candeloro E, Alfonsi E, Callieco R, Cosi V (2004). Fatigue in multiple sclerosis: multidimensional assessment and response to symptomatic treatment. *Mult Scler* **10**:462–468.

Schwid SR, Thornton CA, Pandya S, Manzur KL, Sanjak M, Petrie MD, *et al.* (1999). Quantitative assessment of motor fatigue and strength in MS. *Neurology* **53**:743–750.

Schwid SR, Covington M, Segal BM, Goodman AD (2002). Fatigue in multiple sclerosis: current understanding and future direction. *J Rehabil Res Dev* **39**:211–224.

Sheean GL, Murray NM, Rothwell JC, Miller DH, Thompson AJ (1997). An electrophysiology study of the mechanism of fatigue in multiple sclerosis. *Brain* **120**:299–315.

Strober LB, Arnett PA (2005). An examination of four models predicting fatigue in multiple sclerosis. *Arch Clin Neuropsychol* **20**:631–646.

van der Werf SP, Evers A, Jongen PJ, Bleijenberg G (2003). The role of helplessness as mediator between neurological disability, emotional instability, experienced fatigue and depression in patients with multiple sclerosis. *Mult Scler* **9**:89–94.