Psychometric study of Turkish version of Fatigue Impact Scale in multiple sclerosis patients

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Abstract

Background: The aims of this study were to test the validity, test–retest reliability, and internal consistency of Turkish version of FIS; the variables affecting FIS score.

Materials and methods: 71 MS patients and 68 healthy subjects were included to the study.

Results: Total FIS score and subscale scores were different statistically between MS patients and healthy volunteers in both first and second FIS applications ($p < 0.001$). These results showed that FIS is validated in divergent direction. BDI score was higher in MS patients than healthy volunteers ($p < 0.001$). There was no statistically significant difference between two study groups for cognitive subscale scores, after the effect of depression was eliminated ($p > 0.05$). To assess the test–retest reliability, the scores of two FIS applications did not differ statistically (cognitive $t = 1.948$ $p > 0.05$, physical $t = 1.420$ $p = 0.160$, social $t = 1.470$ $p = 0.146$, total $t = 1.990$ $p = 0.05$). Intraclass correlation coefficients were 0.89 (99% confidence interval: 0.79–0.94) for cognitive, 0.95 (0.91–0.97) for physical, 0.91 (0.83–0.95) for social, and 0.93 (0.86–0.96) for total FIS scores ($p < 0.001$). EDSS correlated with physical subscores in both applications of FIS.

Conclusion: Turkish version of FIS, which is valid and reliable, seems an appropriate tool for the assessment of the effects of fatigue in Turkish MS population.

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Keywords: Multiple sclerosis; Fatigue; Fatigue Impact Scale; Validation; Test–retest reliability

1. Introduction

The most common and disabling symptom in multiple sclerosis (MS) is severe fatigue, present in 65 to 97% of MS patients [1–6]. Fatigue induced by MS is different from those seen in healthy people [7]. It is unique to the disorder and is not just an extreme form of the "tiredness" but rather a "short-circuiting" type of fatigue which is incompatible with the activities performed. 15–40% of MS patients complain fatigue as a disabling problem that causes mainly physical, social, and cognitive incapacity as well as unemployment [8–10].

In order to evaluate the multidimensional aspect of fatigue, several scales have been developed. Fatigue Impact Scale (FIS) (Fisk et al., 1994) is a commonly used fatigue scale in both clinical and experimental studies [11].

We planned to test the validity, test–retest reliability, and internal consistency of Turkish version of FIS; the variables affecting FIS score.

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2. Materials and methods

2.1. Fatigue Impact Scale

FIS is a multidimensional scale measuring the physical, cognitive, and social effects of fatigue. It comprises 40 questions, of which 10 related to cognitive, 10 to physical, and 20 to social subscales. Each question scores between 1 and 4, changing from minimal to severe degrees. The maximum total score is 160.

We defined the level of patients' disability using Expanded Disability Status Scale (EDSS) [12] before the application of FIS. Additionally, Beck Depression Inventory (BDI), was applied to determine the depression level of patients. Turkish version of BDI is a 21-question inventory on general depressive emotions and activities [13].

2.2. Translation

Original scale was translated to Turkish independently by two specialists who have not seen the scale before. These Turkish translations were then back-translated to English by other two specialists who have also not seen the scale before. Since there was no significant difference between original and back-translated version of scale, Turkish version of scale was accepted. After translation procedures, the study group including a neurologist, three physical therapists, a psychometric consultant, and a statistician was formed.

2.3. Patients

The study was conducted between May 2003 and May 2004. After randomly defining the patients registered in Hacettepe University Neurology Department and Ankara

Table 1
Demographic and clinical characteristics of MS patients and healthy volunteers [a]

		MS patients ($n=71$)	Healthy volunteers ($n=68$)
Age (year)		38.6±9.9	36.4±9.3
Gender	Female	43 (60.6%)	38 (55.9%)
	Male	28 (39.4%)	30 (44.1%)
Education status	Elementary school	10 (13.9%)	10 (10.2%)
	Middle school	6 (8.3%)	5 (7.4%)
	High school	20 (27.8%)	17 (25.0%)
	University	35 (49.3%)	36 (52.9%)
Marital status	Married	40 (56.3%)	50 (73.5%)
	Singled	25 (34.8%)	18 (%26.5)
	Divorced	6 (%8.3)	–
MS duration (year)		9.42±6.39	–
EDSS		3.94 (1.0–9.5)	–

MS: multiple sclerosis, EDSS: Expanded Disability Status Scale.
[a] Data were presented as n (%), mean±standard deviation or median (range).

Table 2
The validity of FIS with the effects of depression

	MS patients ($n=71$)	Healthy volunteers ($n=68$)	t value	p value
FIS$_1$				
Cognitive subscale	7.7±6.0	5.7±5.3	2.163	<0.05
Physical subscale	12.3±7.3	5.2±5.0	6.641	<0.001
Social subscale	19.5±14.1	9.3±9.4	5.053	<0.001
Total	39.6±24.2	20.2±17.8	5.389	<0.001
BDI$_1$	12.3±7.7	8.0±8.7	3.120	0.002
FIS$_2$				
Cognitive subscale	6.8±6.1	4.7±5.1	2.118	<0.05
Physical subscale	11.7±7.2	4.3±5.2	7.036	<0.001
Social subscale	18.1±13.7	7.5±8.6	5.507	<0.001
Total	36.6±24.4	16.5±17.4	5.608	<0.001
BDI$_2$	11.7±8.6	6.2±7.5	4.115	<0.001

FIS$_1$ and FIS$_2$: first and second application of Fatigue Impact Scale.
BDI$_1$ and BDI$_2$: first and second application of Beck Depression Inventory.

Chapter of Turkish Society of Multiple Sclerosis, patients who volunteered were included to the study. Patients were informed and gave written consent before entering the study. Inclusion criteria were diagnosis of MS according to Poser criteria [14], older than 18 years of age, and being informed about diagnosis. Exclusion criteria were history of any attack during the last month and presence of another disease. Totally, 71 MS patients and 68 healthy subjects who were similar to patients regarding age, gender, and education status were included in the study. Local ethics committee approved the study.

2.4. Application of Fatigue Impact Scale

A physical therapist instructed the patients on how to complete the FIS. Before FIS application, A Turkish version of Beck Depression Inventory (BDI) was applied to determine depressive emotions and activities. Illiterate patients were helped when needed. Any questions of Turkish BDI or FIS were explained without any comment when needed. Both scales were applied two times one-week apart to all subjects in both study groups.

2.5. Statistical analysis

All data were analyzed using the software package SPSS for Windows Standard Version 11.0.1, 2001. Student t test was used to analyze the difference between MS patients and healthy volunteers. The effect of depression of FIS scores and clinical validity of scale were determined by co-variance analysis. Intraclass correlation coefficient (ICC) and paired t test were used to define reproducibility and reliability of FIS. The multitrait analysis approach was adopted to test whether conceptualisation into domains fitted the data, and whether the results of the Turkish scale replicated the results obtained with the English scale in terms of internal consistency and reliability (Cronbach's alpha). Additionally, the effect of patients' age, duration of disease, EDSS score, and BDI

Table 3
The validity of FIS after controlling for depression by co-variance analysis

	MS patients (n=71)	Healthy volunteers (n=68)	t value	p value
FIS$_1$				
Cognitive subscale	6.9±4.6	6.6±4.7	0.361	>0.05
Physical subscale	11.2±4.9	6.3±4.9	5.746	<0.001
Social subscale	17.3±8.6	11.6±8.6	3.825	<0.001
Total	35.4±14.4	24.5±14.4	4.386	<0.001
FIS$_2$				
Cognitive subscale	5.4±4.3	6.1±4.3	0.857	>0.05
Physical subscale	10.2±4.4	5.9±4.5	5.425	<0.001
Social subscale	15.0±7.4	10.6±7.4	3.384	<0.001
Total	30.7±12.8	22.7±12.8	3.589	<0.001

FIS$_1$ and FIS$_2$: first and second application of Fatigue Impact Scale, MS: multiple sclerosis.

score on FIS score was defined by Pearson Correlation Signal test.

3. Results

The demographic and clinical characteristics of MS patients and healthy volunteers were given in Table 1. There was no statistically significant difference between two groups regarding age, gender, and education level, but marital status was different between groups.

Total FIS score and physical and social subscale scores were different statistically between MS patients and healthy volunteers in both first and second FIS applications ($p<0.001$). Although cognitive subscale scores were similar in study groups, the difference was statistically significant ($p<0.05$). These results showed that FIS is validated in divergent direction. In both applications, BDI score was higher in MS patients than healthy volunteers ($p<0.001$) (Table 2). To define the effect of depression on FIS score, co-variance analysis was performed. After the effect of depression was eliminated, FIS total, physical, and social subscale scores decreased slightly but FIS scores were still significantly higher in MS patients than healthy volunteers in both applications of scale ($p<0.001$) (Table 3). There was no statistically significant difference between two study groups

Table 4
Internal consistency of FIS (Cronbach's alpha values)

	MS patients (n=71)	Healthy volunteers (n=68)
FIS$_1$		
Cognitive subscale	0.911	0.912
Physical subscale	0.919	0.893
Social subscale	0.919	0.934
Total	0.962	0.959
FIS$_2$		
Cognitive subscale	0.938	0.922
Physical subscale	0.937	0.914
Social subscale	0.957	0.870
Total	0.971	0.937

FIS$_1$ and FIS$_2$: first and second application of Fatigue Impact Scale, MS: multiple sclerosis.

Table 5
The correlation coefficients between EDSS and FIS in MS patients by Pearson Correlation Signal test

	FIS$_1$		FIS$_2$	
	r	p value	r	p value
Cognitive subscale	−0.155	0.198	−0.145	0.229
Physical subscale	0.428	<0.05	0.412	<0.001
Social subscale	0.346	0.003	0.269	0.023
Total	0.292	0.013	0.236	0.047

EDSS: Expanded Disability Status Scale, FIS$_1$ and FIS$_2$: first and second application of Fatigue Impact Scale, MS: multiple sclerosis.

for cognitive subscale scores, after the effect of depression was eliminated ($p>0.05$) (Table 3).

To assess the test–retest reliability, the scores of two FIS applications that were one-week apart did not differ statistically (cognitive $t=1.948$ $p>0.05$, physical $t=1.420$ $p=0.160$, social $t=1.470$ $p=0.146$, total $t=1.990$ $p=0.05$). However there were significant differences in total and subscale scores between two applications of FIS in healthy volunteers ($p<0.05$). There were also significant differences in BDI scores in healthy volunteers ($p<0.05$). All scores were usually lower in the second application.

Intraclass correlation coefficients (99% confidence interval) were 0.89 (0.79–0.94) for cognitive, 0.95 (0.91–0.97) for physical, 0.91 (0.83–0.95) for social, and 0.93 (0.86–0.96) for total FIS scores ($p<0.001$).

Cronbach's alpha values showed the internal consistency of FIS (Table 4).

Although, age and disease duration were not correlated with FIS scores ($p>0.05$), EDSS correlated with physical subscores in both applications of FIS (Table 5).

4. Discussion

FIS is a multidimensional scale for the measurement of the effects of fatigue on the daily life activities and quality of life of MS patients. Although it was shortened from 40 questions for practical reasons, we planned to validate the original version of the scale in this study. German and Swedish versions of FIS were developed before [15,16].

In our study, MS patients and healthy volunteers were different regarding marital status. Being a divorcee or single may affect the psychological state and quality of life of patients. The effect of marital status may change greatly in different cultures. Single or divorced persons usually do not live alone in Turkey. They live mostly in the same house with their close relatives and their families support them. Therefore, marital status may not substantially increase depression causing significant changes in quality of life in this population.

We found a significant difference between total FIS scores of MS patients and healthy volunteers in both applications of scale ($p<0.001$). The most significant difference was in social and physical subscales ($p<0.001$).

Although the cognitive subscales were similar in both groups, the difference was also statistically significant ($p < 0.05$). In the initial validation study of FIS, the most remarkable differences had been found also in social and then physical subscales. The cognitive subscale differed the least [11]. The results of our study were similar to the findings in literature in this respect. These findings showed that linguistically adapted version of FIS is validated divergently.

Most of the patients felt uncomfortable with the 29th item of social subscale on sexual activity. Especially single patients were reluctant to answer this question. This observation showed the necessity of cultural adaptation for this kind of scale. Since this was the only question in the scale and there was no other way of asking it we decided not to make any adaptation.

BDI scores between 10 and 18 indicate minimal to moderate level of depression [17]. BDI scores of MS patients in our study were 12.3 and 11.7. Since these scores showed minimal to moderate level of depression in MS patients, the effect of depression on the Turkish version of FIS was evaluated. After correcting for the depression, FIS scores decreased slightly. However total, physical subscale, and social subscale scores difference was still present in study groups ($p < 0.001$). On the other hand, difference in cognitive subscale scores was eliminated ($p > 0.05$). This was an unexpected finding in our study. We interpreted this finding in two different ways. First, fatigue and depression may interfere and this may affect scoring. While depression may increase artificially with the effect of fatigue, fatigue is also affected by depression. The reason for unvalidation of cognitive subscale when the effect of depression was eliminated, may be the presence of cognitive subscale in both scales. However almost all of the depression-related scales contain questions similar to those in cognitive subscales of BDI. The cognitive subscales of BDI and FIS contain 8 and 10 questions, respectively. The 8 items in cognitive subscale of BDI are "pessimism, past failures, guilty feelings, punishment feelings, self-dislike, self-criticism, and worthlessness". Cognitive subscale of BDI focuses on the interference of cognitive functions with depression regarding pyschologic emotions and behaviors. Cognitive subscale of FIS includes questions, which are related with cognition functionally related to increasing severity with fatigue, drowsiness, forgetting, slow thinking, attention, difficulty in concentration, and difficulty in deciding. These two scales have both cognitive subscales nevertheless when behavioral and functional aspects are considered, they have some differences.

Due to the complicated structure of depression-related fatigue and MS-induced fatigue measuring this difference is problematic with the given scales.

Second, since cognition is one of the most complicated brain functions, it should be evaluated multidimensionally. Cognitive subscale of FIS evaluates the effect of fatigue on cognitive state unidimensionally and grossly. Therefore, the cognitive subscale of FIS is not found to be a sensitive measure for the cognitive functions of MS and therefore was not valid.

Reproducibility of these kinds of tests is important. In the psychometric study of FIS in 54 MS patients by Mathiowetz, intraclass correlation coefficients of scale were between 0.68 and 0.85 [18]. These values were between 0.49 and 0.80 in the study on German version of FIS [15]. In our study intraclass correlation coefficients were between 0.89 and 0.95 and higher than these previous studies.

The results of two FIS applications one-week apart were not different in MS group ($p > 0.001$). These two findings showed that Turkish version of FIS has good test–retest reliability. In the healthy volunteers, there were significant differences between two applications of both FIS and BDI ($p < 0.05$). Since healthy people have no pathological fatigue, FIS scores on the effect of fatigue on daily activities and quality of life changes depend on the severity of daily fatigue. This may be the reason for the difference between two FIS applications one-week apart. Same happens for BDI scores. The BDI scores between 5 and 9 are accepted normal [17]. The mean BDI scores of healthy population in our study were 8.01 and 6.15 in the first and second applications, respectively. These scores showed that the healthy group was not depressive. Since they were not depressive, daily differences between two applications of scale were expected.

In the internal consistency evaluation of FIS in initial validation study, Cronbach's alpha values had been found to be higher than 0.98 for total scale and 0.87 for subscales [11]. In our study, Cronbach's alpha values were higher than 0.97 for total scale and 0.91 for subscales. High Cronbach's alpha values indicate strong internal consistency of scale.

There was a correlation between EDSS score and physical subscale of FIS in our study. Previous studies showed a positive relation between Fatigue Severity Scale and disability [19,20]. These studies found that increased severity of disability increases severity of fatigue.

The correlation of EDSS to physical subscale in our study can be explained by the moderate level of disability (EDSS: 3.94) of patients. No previous study showed FIS and disability correlation.

Similar to the results of many previous studies, depression had high correlation with total and subscale scores of FIS in our study.

5. Conclusion

In this validation study of FIS, the most remarkable differences had been found also in social and physical subscales. The cognitive subscale differed the least. However our results showed that FIS is validated in divergent direction. After the effect of depression was eliminated, FIS total, physical, and social subscale scores were still significantly high in MS patients. There was no valid cognitive subscale, when the effect of depression was eliminated.

High Cronbach's alpha values indicate strong internal consistency of scale. There was a correlation between EDSS score and physical subscale of FIS.

There were two important limitations of this study. Firstly, we could not measure the cognitive fatigue in healthy depressive group. If this parameter could have been studied in a comparative study design, we would be able to define the effect of depression and MS-induced fatigue on cognitive functions and their differential diagnosis. A further study on the cognitive fatigue in healthy depressive group was planned. Secondly, detailed cognitive assessment other than FIS and BDI was not performed in MS patients.

In spite of these limitations Turkish version of FIS, which is valid and reliable, seems an appropriate tool for the assessment of the effects of fatigue on health-related quality of life in Turkish MS population.

Acknowledgments

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