Validity and Reliability of the Turkish Version of the Monitoring My Multiple Sclerosis Scale

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ABSTRACT

Introduction: This research was conducted to adapt the Monitoring My Multiple Sclerosis (MMMS) scale, which is a scale used for self-evaluation by multiple sclerosis (MS) patients of their own health and quality of life, to Turkish and to determine the psychometric properties of the scale.

Methods: The methodological research was conducted in the outpatient MS clinic of a university hospital between January and September 2013. The sample in this study consisted of 140 patients aged above 18 who had a diagnosis of definite MS. Patients who experienced attacks in the previous month or had any serious medical problems other than MS were not included in the group. The linguistic validity of MMMS was tested by a backward-forward translation method and an expert panel. Reliability analysis was performed using test-retest correlations, item-total correlations, and internal consistency analysis. Confirmatory factor analysis and concurrent validity were used to determine the construct validity. The Multiple Sclerosis Quality of Life-54 instrument was used to determine concurrent validity and the Expanded Disability Status Scale, Hospital

Anxiety and Depression Scale, and Mini Mental State Examination were used for further determination of the construct validity.

Results: We determined that the scale consisted of four factors with loadings ranging from 0.49 to 0.79. The correlation coefficients of the scale were determined to be between 0.47 and 0.76 for item-total score and between 0.60 and 0.81 for items and subscale scores. Cronbach's alpha coefficient was determined to be 0.94 for the entire scale and between 0.64 and 0.89 for the subscales. Test-retest correlations were significant. Correlations between MMMS and other scales were also found to be significant.

Conclusion: The Turkish MMMS provides adequate validity and reliability for assessing the impact of MS on quality of life and health status in patients.

Keywords: Multiple sclerosis, Monitoring My Multiple Sclerosis Scale, health assessment, validity, reliability

INTRODUCTION

Multiple sclerosis (MS) is an inflammatory and degenerative disease of the central nervous system. MS is a chronic and progressive disease causing important limitations in physical, emotional, and social functions in patients and affecting their quality of life (1,2,3).

Multiple sclerosis is the leading disease among those causing non-traumatic neurological deficits in adults; there are 2-2.5 million MS patients worldwide and 0.4 million in Europe (4,5). In a systematic review and meta-analysis study performed by Heydarpour et al. (6) including North Africa and Middle Eastern countries (52 countries), MS prevalence was reported as 52:100,000 with an increasing number of patients every year. Except a few local MS prevalence studies, the exact prevalence of MS in Turkey is unknown. MS prevalence was found to be 101:100,000 in an epidemiological study conducted in a district of Istanbul (Maltepe) and 30:100,000 in Edirne, a city located in the west but with similar latitude. Turkey is believed to be at medium risk for MS (6,7).

Many symptoms are observed in MS patients. Disabilities occur in some patients with accumulation of these symptoms. Because of physical and emotional dysfunctions, limitations in daily functioning and unpredictable disease-course psychosocial problems are common in patients (8,9,10). Nurses who care for patients with numerous complicated problems have important responsibilities in the maintenance of patients' well-being and daily needs, management of symptoms, and supporting compliance to immunomodulatory treatments (2,11,12).

A continuous monitoring of functioning is important to determine health needs, since MS is a progressive disease that has a substantial impact on all aspects of life (13). Evaluation of the subjective perception of health provides a possibility to understand the problems through patients' perspective. Perception of health evaluation helps to gain an understanding on the impacts of the disease process and treatment on a patient's daily life, defining the social, emotional, and physical needs of the patients. Therefore, it contributes to the development of an individual management plan which meets a patient's needs, and it could be used as a self-evaluation tool by the patients to monitor their symptoms (2,3,11,14,15,16,17).

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Many scales have been developed to evaluate health needs of MS patients. However, the existing assessment measures either do not include a number of functional areas important to the patient, or they are not practical to use because they are time consuming. Therefore, the International Organization of Multiple Sclerosis Nurses (IOMSN) decided to develop a reliable, user-friendly, and valid self-administered measure that included often-neglected areas of MS symptoms. Hence, Gulick et al. (3) developed a self-assessment scale (Monitoring My MS Scale [MMMS]) for patients, which could help them to monitor their physical condition and evaluate outcomes of healthcare. The aim of this study was to adapt this scale to the Turkish MS patients and examine its psychometric properties.

METHODS

Design, Sample, and Setting

The study design was methodological and descriptive research type. The study was conducted on MS patients who were admitted to the outpatient MS clinic of a university hospital between January and September 2013. In cultural adaptation studies for psychometric analysis questionnaires, it is generally recommended to study the analyses on a population with a size of at least five-fold of the number of questionnaire items (18,19). In this study, based on the number of the questionnaire items, a sample size of 140 patients with definite MS was targeted. Patients who were able to communicate effectively and did not have an attack in the previous month were included.

Ethical Consideration

Before data collection, ethical approval was obtained from the Clinical Research Ethical Committee of the Hospital (2012/1717-1277). The study was explained and informed consent was obtained from the patients included in the study.

Data Collection

The researchers applied the questionnaire to the patients fulfilling the inclusion criteria. For test-retest application, second meetings were performed with 30 patients in the same group after 2 weeks (19).

Instruments

Monitoring My Multiple Sclerosis Scale was employed for data collection from patients. MMMS was developed by Gulick et al. (3) to provide the possibility to track health status of patients by themselves. The 26-item tool has four subscales evaluating physical health (10 items), relationships (8 items), energy (3 items), and cognitive/mental (5 items) functions. The minimum score that could be obtained from the scale is 26 and the maximum is 104. Higher scores show the satisfaction of the patients by their status and functions. Expanded Disability Status Scale (EDSS) (20), Mini Mental State Examination (MMSE) (21), and Hospital Anxiety and Depression Scale (HADS) (22) were used to investigate correlations with MMMS. In addition, to study concurrent validity Multiple Sclerosis Quality of Life-54(MQSL-54), which was developed by Vickrey et al. (23) and adapted for the Turkish population, was used (2,24).

Linguistic Validity

The linguistic validity of the tool was performed following steps stated in the literature; (1) the scale was translated independently from English to Turkish by two individuals (2). These two translations were reviewed by two other MS experts and combined into one scale by consensus (3). The combined translation was back translated to English by a translator (4,25,26). The back translated scale was compared to the original English

scale; the Turkish version was discussed and the final changes were performed. Subsequently, the scale was reviewed by an MS expert panel. The content validity index of the tool was calculated as 0.95. The scale was applied to a group of 20 people following the recommendations made by experts (Supplementary file). No changes were necessary for the scale as each item was found to be clearly understandable in the pilot study (19,27).

Statistical Analysis

Statistical Package for the Social Sciences (SPSS) version 21.0 (IBM, Armonk, N.Y., USA) and LISREL 8.5 for Windows (IL, USA) programs were used for statistical analysis of data obtained from the study. Normality distribution of the tests used in comparison was evaluated using the Kolmogorov-Smirnov Test. Parametric tests were chosen as the distribution was defined normal. Descriptives, Cronbach's alpha values, Pearson correlation, confirmatory factor analysis, goodness of fit indices, and independent samples t-test were used for statistical analysis.

RESULTS

We included 140 patients in the study. The mean age of the patients was 35.4 ± 10.5 years ($\pm$ standard deviation [SD], range, 18-62), 72.9% ($n=102$) were females, and 62.1% ($n=87$) had high school and above education status. Approximately one-half of the patients were homemakers and most of the patients were married (Table 1).

The mean disease duration until diagnosis was 7.6 ± 6.04 years, and the most (75.7%) common MS subtype was relapsing remitting MS (RRMS). Most of the patients (72.9%) were on a disease-modifying therapy (DMT). The functional status of the patients was evaluated and most of them were ambulatory, one-fourth (25.7%) were anxious, and approximately one-half (44.3%) were depressive (Table 2).

The confirmatory factor analysis was performed to evaluate the construct validity of the Turkish version of MMMS. Goodness of fit indices, including Goodness of Fit Index (GFI), Root-Mean-Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (S-RMR), were examined. The RMSEA value of the model was found to be 0.077. Chi-square values were statistically significant ($\chi^2=529$; $n=140$, $SD=289$, $df=1.83$, $p=0.000$). The $\chi^2/SD=529/289=1.83$ value was <2 ; therefore, it was accepted as between good fit limits. In this context, factor analysis confirmed the structure of the Turkish scale. Factor loadings of the Turkish MMMS are shown in Table 3.

To test the reliability of the scale test-retest correlations and Cronbach's alpha values were calculated (Table 4). For test-retest analysis, Pearson product-moment correlation coefficients were calculated and determined between 0.61 and 0.84. These results support the scale's stability over time. Cronbach's alpha coefficients calculated to evaluate internal consistency were found to be between 0.643 and 0.891 (Table 4). The mean MMMS score of the patients was 70.5 ± 12.6 (range 30-99), and the highest scores were obtained from the relationships subgroup. "Item-subscale score correlations" of the scale were between 0.60-0.81 and "item-total score correlations" were 0.47-0.75 ($p<0.001$).

Scale scores were evaluated according to sociodemographic and MS-related characteristics to further support the construct validity. There was no difference between MMMS subscale scores of participants as related to sociodemographics. There was one exception; energy subscale showed differences as related to gender and marital status. In the energy subscale,

Table 1. Sociodemographic characteristics of the patients (n=140)

Characteristics	n	%
Age (X±SD, Range)	35.4±10.5	18-62
Gender		
Male	38	27.1
Female	102	72.9
Education		
Primary or secondary school	53	37.8
High school	30	21.4
University	57	40.7
Employment		
Employed	48	34.3
Retired	9	6.4
Disability pensioner	3	2.1
Unemployed	11	7.9
Housewife	60	42.9
Student	9	6.4
Marital status		
Single	46	32.9
Married	90	64.3
Divorced/widowed	4	2.8
X±SD: mean±standard deviation		

female participants had a significantly lower score than did male participants (2.3 ± 0.6 vs. 2.6 ± 0.6 ; $t=2.0.19$, $p=0.045$) and married participants had significantly lower scores than single or divorced or widowed participants (2.6 ± 0.5 vs. 2.7 ± 0.5 ; $t=2.235$, $p=0.027$). The mean score of the group with high school or above education was higher compared to the less educated group, and the mean score of working group was higher than that of the group of patients who were not working. Patients with secondary progressive MS (SPMS) were detected to have worse subscale and total scores compared to those with RRMS (total score: 62.1 ± 13.1 vs. 73.2 ± 11.2 ; $t=4.764$, $p=0.000$). No difference of scores was observed between groups in terms of DMT use.

The relation of MMMS scale and functional status was evaluated and statistically significant correlations were found between MMMS and EDSS and MMSE and HADS. A moderately strong correlation was found between MMMS and MSQ-54, the scale used for concurrent validity (Table 5).

DISCUSSION

The aim of this study was to translate MMMS from English to Turkish and evaluate the psychometric properties. MMMS is a scale developed by Gulick et al. (3) on behalf of IOMSN in 2011 to assess the health status of MS patients. After the linguistic validity, which was realized using the forward-backward method, confirmative factor analysis was performed to investigate the construct validity of the scale and to examine items' representations in defined subscales. Items were grouped into four factors with factor loadings between 0.49 and 0.79, and the scale was found to be in a four-factored structure as physical, relationships,

Table 2. Clinical characteristics of the patients (n=140)

Characteristics	n	%
Time since diagnosis (mo) (X±SD, range)	92±72.5	6-432
Type of MS		
Relapsing remitting	106	75.7
Secondary progressive	28	20.0
Primary progressive	6	4.3
Use of disease modifying therapy	102	72.9
Regular use of medications	116	78.4
Regular attendance to follow-ups	128	88.5
Hospitalization within the last year	28	20.0
EDSS (X±SD, Range)	2.7±1.8	1-8
Ambulatory (EDSS 0-3.5)	103	73.6
Ambulatory with assistance (EDSS 4-6)	31	22.1
Dependent (EDSS 6.5-9)	6	4.3
HADS Anxiety (X±SD, Range)	7.4±4.4	0-18
Yes	36	25.7
No	104	74.3
HADS Depression (X±SD, Range)	6.7±3.9	0-18
Yes	62	44.3
No	78	55.7
MMSE (X±SD, Range)	28±1.6	44.3
EDSS: Expanded Disability Status Scale; HADS-A: Hospital Anxiety and Depression Scale- Anxiety; HADS-D: Hospital Anxiety and Depression Scale- Depression; MMSE: Mini Mental State Examination; X±SD: mean±standard deviation		

energy, and mental/cognitive similar to the original version. The model was seen to be between acceptable limits according to goodness of fit indices (χ^2 , RMSEA, S-RMR). Based on these results the Turkish version of the MMMS was accepted as a valid scale and reliability analyses of the scale were performed.

To test the reliability of the scale item-subscale correlation, Cronbach's alpha, test-retest correlation and concurrent validity methods were used. Item-subscale and item-total correlations were calculated to inspect the relation between scale items and subscales. Although there is no consistency in the threshold of item-total score correlation coefficient in literature, in general, the lowest level is accepted as 0.20. Items with correlation coefficients between 0.30 and 0.40 are reported as "good" and those with coefficients above 0.40 as "very good" (27). "Item-total score correlations" of 26 items in this study were investigated; correlation coefficients of the items were found between 0.47 and 0.75, item-subscale correlation coefficient was between 0.60 and 0.81 and statistically significant. The contribution of each individual item to the subgroup and to the total score, and the contribution of each subgroup to the total score were found to be sufficient. Another method recommended for reliability evaluation of Likert-type scales is the Cronbach's alpha reliability coefficient (19). In the study conducted by Gulick (3), Cronbach's alpha coefficient was between 0.67 and 0.85 in the subgroups and Cronbach's alpha coefficient was 0.90 for all the scales. In our study, Cronbach's alpha coefficient was found to be high for total scale (0.94) and between highly reliable limits for all

Table 3. Factor loadings: monitoring my multiple sclerosis scale (n=140)

	Physical	Relation-ships	Energy	Cognitive/Mental
1 I believe my health is	0.59			
2 I feel the current status of my MS is	0.66			
5 My mobility is	0.74			
7 My bladder functioning is	0.62			
8 My bowel functioning is	0.52			
9 My sexuality and intimate relationship is	0.66			
10 Management of my personal care is	0.72			
18 My ability to work or do things I need to do is	0.79			
24 Satisfaction with my level of physical activity is	0.72			
25 I can do anything I set my mind to do	0.64			
11 My communication to others is		0.73		
13 The living situation where I live is		0.70		
15 My relationships with family members are		0.65		
16 My relationship with my spouse or significant other is		0.53		
17 My current relationship with friends is		0.64		
19 My ability to do things for fun that I enjoy is		0.65		
20 My current financial situation is		0.65		
26 I am looking forward to the future		0.64		
3 Most of the time my energy level is			0.78	
4 Generally, my mood and spirits are			0.57	
23 How rested do you feel after sleeping			0.52	
6 My ability to cope with pain is				0.49
12 The adequacy of my diet is				0.63
14 My thinking and memory are				0.54
21 My life as a whole is				0.77
22 My spiritual well-being is				0.74

Table 4. Descriptive and cronbach alpha values and test-retest correlations of monitoring my multiple sclerosis scale and (n=140)

Subgroup	Mean±SD	Cronbach's α	Test-retest	
			r	p
Physical	2.5±0.5	0.891	0.941	<0.001
Relationships	2.9±0.5	0.855	0.945	<0.001
Energy	2.4±0.6	0.643	0.841	<0.001
Cognitive/ Mental	2.6±0.5	0.761	0.888	<0.001
Total	70.5±12.6	0.940	0.963	<0.001
SD: standard deviation				

subgroups (0.64-0.89). In our study, although our test-retest correlations were lower than the original scale (0.61-0.84 vs. 0.87-0.96), they can still be considered acceptable, indicating that the scale has a feature to give similar results with repeated measurements. Another way to detect the validity of the scale is to compare it with an equivalent scale. MSQL-54 Quality of Life Scale was used for this purpose. Significant and strong cor-

relations were found between MMMS total score and MSQL-54 physical composite score ($r=0.71$, $p<0.001$) and MSQL-54 mental health composite score ($r=0.65$, $p<0.001$). Therefore, the construct validity of MMMS in our sample was confirmed.

To support the construct validity, MMMS scores were evaluated according to sociodemographic and MS-related characteristics. The sample demonstrated typical characteristics of MS (young age, female dominance, and RRMS) (28,29,30). Most of the patients were ambulatory since the study was conducted in an outpatient clinic. Lower scores of energy subscale in female and married patients were expected as these groups have more responsibilities in daily life. Higher scores of all the subscales of MMMS in educated and working group is a comparable result reported in many quality of life studies (2,31,32). Lower mean scores on the MMMS scores for SPMS participants compared to RRMS participants further supports the construct validity of the MMMS scale. As expected, patients with RRMS reported better health status than did those with SPMS.

The relation of MMMS with functional scales (EDSS, MMSE, and HADS) was analyzed to support construct validity. Negative strong

Table 5. Correlations of MMMS scores with EDSS, MMSE, HADS and MSQL-54 (n=140)

Scales MMMS	Physical		Relationships		Cognitive/Mental		Energy		MMSS Total	
	r	p	r	p	r	p	r	p	r	p
MMSE	0.32	<0.001	0.20	0.018	0.18	0.026	0.10	0.240	0.26	<0.001
EDSS	-0.56	<0.001	-0.25	0.002	-0.19	<0.001	-0.23	0.006	-0.41	<0.001
HADS-A	-0.37	<0.001	-0.45	<0.001	-0.46	<0.001	-0.42	<0.001	-0.47	<0.001
HADS-D	-0.59	<0.001	-0.53	<0.001	-0.48	<0.001	-0.45	<0.001	-0.60	<0.001
MSQL-54 PHC	0.74	<0.001	0.54	<0.001	0.57	<0.001	0.55	<0.001	0.71	<0.001
MSQL-54 MHC	0.61	<0.001	0.57	<0.001	0.51	<0.001	0.56	<0.001	0.65	<0.001

HADS-A: Hospital Anxiety and Depression Scale- Anxiety; HADS-D: Hospital Anxiety and Depression Scale- Depression; MSQL-54 PHC: Multiple Sclerosis Quality of Life Scale-54 Physical health composite; MSQL-54 MHC: Multiple Sclerosis Quality of Life Scale-54 Mental health composite

correlations were found between EDSS and MMMS; as expected, the strongest correlation was obtained from physical subscale. Similar results were reported in the original study of the scale (3). Among the three function scales, the weakest correlations were obtained for MMSE. Correlations between MMMS and MMSE scores were found to be significant but weak. A weak correlation was found between MMMS and HADS anxiety scores, and a moderately strong correlation was found with depression scores. A close relation of quality of life or self-assessed health status and anxiety and depression has been shown in many studies (1,2,31).

Some limitations of this study should be considered when results are interpreted. The study being conducted in an outpatient clinic and most of the patients being ambulatory are limitations of the study. However, in relation to other aspects, the sample group demonstrated the typical characteristics of MS.

In conclusion, the Turkish version of MMMS showed adequate validity and reliability for assessing the impact of MS on quality of life and health status from a patient perspective. Covering all essential aspects of quality of life in a user-friendly format, MMMS may be useful especially in time-limited settings. Patient self-monitoring using this scale can promote partnership between MS patients and their healthcare providers. Further research in a larger sample and further psychometric testing by using samples with various MS types are recommended.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of İstanbul University İstanbul School of Medicine (No: 2012/1717-1277).

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