

A validity and reliability study of the Turkish Multidimensional Assessment of Fatigue (MAF) scale in chronic musculoskeletal physical therapy patients

Yücel Yildirim^a and Gülbin Ergin^{b,*}

^a*Department of Physical Therapy and Rehabilitation, Faculty of Health Sciences, Cyprus International University, Nicosia, Cyprus*

^b*Dr. Ismail Atabek Physical Therapy and Rehabilitation Centre, Izmir, Turkey*

Abstract.

BACKGROUND AND OBJECTIVES: Fatigue is primarily a subjective experience and self-report is the most common approach used to measure fatigue. Numerous self-report instruments have been developed to measure fatigue. Unfortunately, each of these measures was tailored for the situation in which fatigue was studied. Therefore, the aim of this study was to determine the reliability and validity of the Turkish language version of the Multidimensional Assessment of Fatigue Scale (MAF-T) in chronic musculoskeletal physical therapy patients.

MATERIAL AND METHODS: The MAF-T was supplied by the MAPI Research Institute, and 69 chronic musculoskeletal physical therapy patients were evaluated. To validate MAF-T, all participants completed the MAF-T and Short Form-36 (SF-36). The MAF was administered again one week later to assess test-retest reliability.

RESULTS: Using Cronbach α , the internal consistency reliability of the MAF-T was 0.90, the Intraclass Correlation Coefficient (ICC) reliability was 0.96. Item-discriminant validity was calculated between $r = 0.14$ and $r = 0.82$. The correlations between the total scores of the MAF-T scale and the subscale scores of SF-36 were negative and significant ($p < 0.01$).

CONCLUSION: The MAF-T is a valid and reliable scale for assessing fatigue in chronic musculoskeletal physical therapy patients.

Keywords: Chronic fatigue, musculoskeletal patients, Multidimensional Assessment of Fatigue, MAF, reliability, validity

1. Introduction

Fatigue can be defined either as a progressive impairment of the force-generating capacity of muscle (peripheral or muscle fatigue) or as a lessened capacity for work and reduced efficiency, usually accompanied by feelings of weariness, sleepiness and irritability [1].

Most authors consider fatigue in terms of a complex subjective and multifactorial construct, with physical, mental and psychological dimensions that are often associated with diminished quality of life [2–5].

Progress in research and improved management depends on having reliable and valid methods of assessment that reflect the problems reported by patients. With the growing recognition of fatigue as a major clinical problem in many conditions, there has been an increase in measures of fatigue, often referred to by synonyms or abbreviations shared with other scales. All scales purport to assess fatigue but being self-report

*Corresponding author: Gülbin Ergin, Dr. Ismail Atabek Physical Therapy and Rehabilitation Centre, 35535, Manavkuyu, Izmir, Turkey. Tel.: +90 232 4624447; Gsm: +90 506 5835101; E-mail: gübin_ergin@hotmail.coms.

scales, the information derived depends on the questions being asked. These will be based on the scale developer's own conceptualization of fatigue and will in turn be answered by the respondent based on his or her own interpretation. This means that different scales may be measuring fundamentally different aspects of the fatigue experience or even potentially distinct constructs. In addition, the use of an instrument developed specifically to measure fatigue in one clinical condition may not be useful in other patient groups if the fatigue experience differs from group to group [6].

Instruments available to assess fatigue can be divided into unidimensional instruments and multidimensional instruments. According to Smets et al., the use of unidimensional instruments excludes the possibility of a more complete description of fatigue [7]. The wording of a single question can introduce substantial differences and may emphasize only one dimension of fatigue [8]. Therefore, we have chosen the Multidimensional Assessment of Fatigue (MAF) scale for this study.

The MAF scale is a good choice when selecting an instrument to measure fatigue in chronic illness because it is easy to administer and score; is relatively short in length (it takes less than five minutes to complete); and assesses the subjective aspects of fatigue including degree, severity, distress, impact, and timing. The questionnaire allows patients to omit activity items that do not apply to them, thus making it a more accurate assessment of the impact of fatigue on activities of daily living (ADLs) [9].

People with musculoskeletal conditions who are experiencing fatigue feel fatigue on most days, and the fatigue varies in intensity and frequency, ranging from heaviness to weariness and exhaustion. Occasionally, a sudden, dramatic and overwhelming 'wipe-out' occurs without warning, forcing victims people are forced to stop and lie down. Fatigue is considered equal to or worse than pain and is deemed unearned (and thus unfair and unpredictable) and unresolving. In all of the qualitative studies cited, patients described not only physical fatigue but also cognitive fatigue, manifesting as an inability to think clearly, concentrate, or be motivated to do anything [10].

Our understanding of the role of fatigue in chronic musculoskeletal physical therapy patients has been hampered by the lack of suitable techniques for its measurement. To facilitate research and patient treatment, the aim of this study was to assess the reliability and validity of the Turkish-language version of the MAF scale for chronic musculoskeletal physical therapy patients.

2. Methods

2.1. Participants

A total of 69 musculoskeletal physical therapy patients were recruited from the Dokuz Eylül University Hospital School of Physical Therapy and Rehabilitation outpatient clinic from June 2008 to December 2008.

Patients who had psychiatric comorbidities (e.g., major depression) or other conditions including physical diseases (e.g., cancer), neurological diseases (e.g., multiple sclerosis and Parkinson's disease) or who reported having uncontrolled or untreated medical illnesses (e.g., anemia or diabetes) were excluded from the study.

Written or oral informed consent was obtained from all subjects before administration of the questionnaire.

2.2. Multidimensional Assessment of Fatigue scale (MAF)

The MAF scale has 16 items that measure five dimensions of fatigue: degree (item 1), severity (item 2), distress (item 3), degree of interference with activities of daily living (items 4–14), and timing (items 15–16). Items 1–14 contain 10-point numerical rating scales and items 15–16 have multiple-choice responses. The 10-point numerical rating scale ranges from 1 (not at all) to 10 (a great deal).

Respondents were asked to reflect on fatigue patterns for the past week. Scoring the MAF results in the Global Fatigue Index (GFI), a composite score of the five dimensions of fatigue described above. If the respondent reported no fatigue (item 1), a zero was assigned to all remaining items (2–16). Respondents who do not perform certain activities for reasons other than fatigue are instructed to check a box to the left of each activity item, and no score was assigned to these items. For all respondents, the score for item 15, which asks about the frequency of fatigue was converted from 1–4 to 2.5–10 by multiplying the responses by 2.5. This conversion then allowed items measuring degree of fatigue (item 1), severity of fatigue (item 2), distress of fatigue (item 3), the average of impact on ADL items (items 4–14), and the newly scored frequency of fatigue item (item 15) to be summed to create the GFI. The index score can range from 1 (no fatigue) to 50 (extreme fatigue) (Appendix 1). The MAF is a revision of the Piper Fatigue Scale, a 41-item measure of fatigue developed for research purposes and tested with oncology patients [9,11].

Table 1
Demographics of Participants ($n = 69$)

Age (year) (X \pm SD)	52.07 \pm 12.43
BMI (kg/m ²) (X \pm SD)	26.40 \pm 3.54
Education level n(%)	
No education	1 (1.4)
Primary education	35 (50.7)
Secondary education	18 (26.1)
University	13 (18.8)
Postgraduate	2 (2.9)
Occupation n (%)	
Unemployed	3 (4.3)
Working	23 (33.3)
Housewife	28 (40.6)
Retired	15 (21.7)

The Turkish version of MAF (MAF-T) was obtained from the MAPI Research Institute (Lyon, France), and we received permission from the author to assess the reliability and validity of this instrument (Appendix 2).

2.3. Reliability of MAF -T

The internal consistency of the scale was assessed using Cronbach's α [12]. The MAF-T questionnaire was administered to the same subjects one week later to assess the test-retest reliability. After the participants provided informed consent, the test-retest reliability was examined using the Intraclass Correlation Coefficient (ICC). The item-discriminant validity was calculated using the Item-Discriminant Correlation.

2.4. Validity of MAF-T

The concurrent validity of the MAF-T was assessed using correlations with the Short Form-36 (SF-36). The SF-36 was constructed to survey health status in the Medical Outcomes Study and was designed for use in clinical practice and research. It assesses eight health domains: limitations in physical activities because of health problems; limitations in social activities because of physical or emotional problems; limitations in usual role activities because of physical health problems; bodily pain; general mental health (i.e., psychological distress and well-being); limitations in usual role activities because of emotional problems; vitality (i.e., energy and fatigue); and general health perceptions [13]. A Pearson correlation analysis (r) was used to determine concurrent validity.

All tests were performed using SPSS software (version 11.5). The statistical significance level was set at 1% ($p < 0.01$).

Table 2
Item-Discriminant Validity and Chronbach α of MAF-T

Questions of MAF	Item-Discriminant Validity	α
MAF - 1	0.81	0.89
MAF - 2	0.82	0.89
MAF - 3	0.81	0.89
MAF - 4	0.58	0.90
MAF - 5	0.58	0.90
MAF - 6	0.72	0.89
MAF - 7	0.65	0.89
MAF - 8	0.14	0.91
MAF - 9	0.65	0.89
MAF - 10	0.21	0.91
MAF - 11	0.66	0.89
MAF - 12	0.76	0.89
MAF - 13	0.61	0.90
MAF - 14	0.50	0.90
MAF - 15	0.64	0.90
MAF - 16	0.50	0.90
Cronbach alpha	0.90	
ICC	0.96	

3. Results

The participants were 69 chronic musculoskeletal physical therapy patients aged 52.07 \pm 12.43 years. Table 1 shows the demographics of the participants.

3.1. Reliability of MAF-T

The reliability of the MAF-T was evaluated in terms of internal consistency and test-retest reliability. The internal consistency reliability for the total scale, as assessed by Cronbach's α , was 0.90. The ICC test-retest reliability was 0.96. The item-discriminant validity was between $r = 0.14$ and $r = 0.82$ (Table 2).

3.2. Validity of MAF-T

For concurrent validity, the correlation between the eight subscales of the SF-36 and the total MAF-T scores are shown in Table 3. The correlations between the subscales of the SF-36 and the total MAF-T score were negative and significant ($p < 0.01$).

4. Discussion

We assessed the MAF, which is used to measure fatigue in different populations such as HIV, multiple sclerosis, and cancer patients as well as postpartum women [14–17].

The MAF allows patients to omit activity items that do not apply to them, thus making it a more accurate assessment of the impact of fatigue on ADLs. To yield

Table 3
The Correlation Analysis Between Multidimensional Assessment of Fatigue (MAF) Questionnaire and SF-36

	SF-36							
	Physical function	Physical role	Pain	General health	Vitality	Social function	Emotional role	Mental health
MAF total	-0.401**	-0.481**	-0.526**	-0.526**	-0.483**	-0.423**	-0.162	-0.331**
SF-36								
Physical function		0.496**	0.513**	0.452**	0.478**	0.576**	0.294*	0.354**
Physical role			0.515**	0.475**	0.442**	0.418**	0.298*	0.385**
Pain				0.635**	0.587**	0.535**	0.208	0.403**
General health					0.623**	0.555**	0.152	0.481**
Vitality						0.482**	0.247*	0.706**
Social function							0.219	0.379**
Emotional role								0.213
Mental health								—

* $p < 0.05$, ** $p < 0.01$.

reliable and valid responses, instructions are included with the instrument. "These questions are about fatigue and the effect of fatigue on your activities during the past week". If no fatigue is reported for the past week on item 1, the participant was instructed to stop because items 2–16 are only applicable if the respondent experienced fatigue in the past week. To assure variability in the outcome variable of fatigue, respondents who report no fatigue are assigned a zero score for items 2–16 and kept in the analysis.

The original MAF (using visual analog scales) was tested with 133 respondents with rheumatoid arthritis (RA) [18,19]. The computed value of Cronbach's α for the original MAF was 0.93. In another study by Belza, scales on the MAF were changed to numerical rating scales and tested in 51 patients with RA using 26 age and gender matched controls and Cronbach's α was also 0.93 [20].

Jump et al. used the MAF to examine several dimensions of fatigue to identify distinguishing characteristics of the fatigue experience of RA patients with and without a history of affective disorder. Cronbach's α in their study for the MAF scale was 0.92 [21].

Neuberger et al. studied the effects of self-selected degrees of exercise participation on measures of fatigue, aerobic fitness, and disease activity. They used the MAF scale to assess fatigue, and Cronbach's α ranged from 0.83 to 0.92 across assessment times for global fatigue and 0.79 to 0.92 for the interference with daily activities subscale [22].

Schmaling et al. proposed applying an operant model of partner responses to illness behavior among couples in which one person had chronic fatigue syndrome to examine the relationship of the partner responses to fatigue-related illness outcomes and reported Cronbach's α for the MAF > 0.92 [23].

In our study, Cronbach's α for the MAF was 0.90, which is much higher than the criterion level of 0.70

for acceptable internal consistency. The ICC for test-retest reliability of the MAF-T was 0.96.

In the original validation of the MAF, concurrent validity was assessed using the Profile of Mood States (POMS) that was completed by the respondents. Of particular interest are the two subscales of fatigue and vigor. Pearson correlations indicated that the MAF has convergent validity with the fatigue subscale and has divergent validity with the vigor subscale (10–11). In Belza's study, the Pearson correlations indicated the MAF has concurrent validity with the POMS fatigue subscale ($r = 0.84$; $p < 0.01$) and divergent validity with the POMS vigor subscale ($r = -0.62$; $p < 0.01$). Stability was determined by analyzing correlations of the MAF at three time points. The stability correlation ranged from a high of 0.73 for controls at time 1 to a low of 0.47 for the controls at time 3 [14].

In our study, the concurrent validity of the total MAF-T score was assessed by correlation with the SF-36. No gold standard exists for evaluating fatigue. Therefore, we cannot prove the validity of instruments that measure fatigue. In the absence of a gold standard, direct comparisons of methods for measuring fatigue with related and existing measures are needed [24]. We compared the discriminant ability of the MAF with quality of life because the participants were primarily patients. The corresponding correlation coefficients between the total MAF-T score and the SF-36 subscales were negative and significant except for emotional role. According to these results, fatigue decreased the patients' quality of life.

There is no correlation between the total MAF score and emotional role, and the item-discriminant validity was low for items 8 (work) and 10 (sexual activity). The reason for this result might be that the participants were from different educational and cultural levels and engaged in various occupations.

Finally, there were some issues regarding the participants examined in this study. The participants had various musculoskeletal diagnoses. In particular, we were not able to recruit participants with specific diagnoses. This inability might have affected the results of our study. Further studies including specific diagnoses are needed to confirm the reliability and validity of MAF-T.

In conclusion, the MAF-T has good reliability and concurrent validity, and it is appropriate for assessing musculoskeletal physical therapy patients.

References

- [1] Goldenberg DL. Fatigue in rheumatoid diseases. *Bull Rheum Dis* 1995; 44: 4-8.
- [2] Piper BF, Lindsey AM, Dodd MJ. Fatigue mechanisms in cancer patients: developing nursing theory. *Oncol Nurs Forum* 1987 (14): 17-23.
- [3] Glaus A. Fatigue in patients with cancer: Analysis and assessment. *Recent Results Cancer Res* 1998; 145: i-xi. 1-172.
- [4] Richardson A. Fatigue in cancer patients: A review of the literature. *Eur J Cancer Care (Engl)* 1995 (4): 20-32.
- [5] Wu HS, McSweeney M. Measurement of fatigue in people with cancer. *Oncol Nurs Forum* 2001 (28): 1371-84; quiz 1385-6.
- [6] Dittner AJ, Wessely SC, Brown RG. The assessment of fatigue: A practical guide for clinicians and researchers. *J Psychosom Res* 2004 (56): 157-170.
- [7] Smets EMA, Garssen G, Bonke B, et al. The multidimensional fatigue inventory (MFI) psychometric qualities of an instrument to assess fatigue. *J Psychosom Res* 1995 (39): 315-25.
- [8] Lewis G, Wessely S. The epidemiology of fatigue: more questions than answers. *J Epidemiol Community Health* 1992 (46): 92-7.
- [9] Hewlett S, Dures E, Almeida C. Measures of fatigue. *Arthritis Care Res* 2011 (63): 263-286.
- [10] Hewlett, S., Nicklin, J. and Trehan, G. (2008) Fatigue in musculoskeletal conditions. *Topical Reviews: Reports on the Rheumatic Diseases Series 6, Autumn 2008 (Number 1)*. 1469-3097.
- [11] Piper B., Lindsey A., Dodd M., Ferketich S., Paul S., Weller S. The development of an instrument to measure the subjective dimension of fatigue. In S. Funk, E. Tornquist, M. Champagne, and R. Wiese (eds), *Key aspects of comfort: Management of pain, fatigue, and nausea*. New York: Springer 1989; 199-207.
- [12] Cronbach LJ. Coefficient alpha and the internal structure of tests. *Psychometrika* 1951 (16): 297-334.
- [13] Ware JE, Snow KK, Kosinski M, Gandek B. SF-36 health survey: manual and interpretation guide. Lincoln (RI) 7 Quality Metric Incorporated 2000.
- [14] Bormann, J., Shively, M., Smith, T., & Gifford, A.. Measurement of fatigue in HIV-positive adults: Reliability and validity of the Global Fatigue Index. *Journal of the Association of Nurses in AIDS Care* 2001 (12): 75-83.
- [15] Schwartz, CE, Coulthard-Morris, L., & Zeng, Q. Psychosocial correlates of fatigue in multiple sclerosis. *Archives of Physical Medicine and Rehabilitation* 1996 (77): 165-170.
- [16] Winstead-Fry, P. Psychometric assessment of four fatigue scales with a sample of rural cancer patients. *Journal of Nursing Measurement* 1998 (6): 111-122.
- [17] Wambach, KA. Maternal fatigue in breastfeeding primiparae during the first nine weeks postpartum. *Journal of Human Lactation* 1998 (14): 219-229.
- [18] Tack (Belza), B. Dimensions and correlates of fatigue in older adults with rheumatoid arthritis. Unpublished doctoral dissertation, School of Nursing, University of California, San Francisco 1991.
- [19] Belza, B., Henke, C., Yelin, E., Epstein, W., & Gilliss, C.. Correlates of fatigue in older adults with rheumatoid arthritis. *Nursing Research* 1993 (42): 93-99.
- [20] Belza, B. Comparison of self-reported fatigue in rheumatoid arthritis and controls. *Journal of Rheumatology* 1995 (22): 639-643.
- [21] Jump RL, Fifield J, Tennen H, Reisine S, Giuliano AJ. History of affective disorder and the experience of fatigue in rheumatoid arthritis. *Arthritis Rheum.* 2004 (51): 239-45.
- [22] Neuberger GB, Press AN, Lindsley HB, Hinton R, et al. Effects of exercise on fatigue, aerobic fitness, and disease activity measures in persons with rheumatoid arthritis. *Res Nurs Health* 1997 (20): 195-204.
- [23] Schmalzing KB, Smith WR, Buchwald DS. Significant other responses are associated with fatigue and functional status among patients with chronic fatigue syndrome. *Psychosom Med.* 2000 (62): 444-450.
- [24] Beurskens AJ, Bultmann U, Kant I, Vercoulen JH, Bleijenberg G, Swaen GM. Fatigue among working people: validity of a questionnaire measure. *Occup Environ Med* 2000 (57): 353-357.

- 3 Most, but not all days
 2 Occasionally, but not most days
 1 Hardly any days

16. To what degree has your fatigue changed during the past week?

- 4 Increased
 3 Fatigue has gone up and down
 2 Stayed the same
 1 Decreased

Appendix 2 Yorgunluęu çok boyutlu deęerlendirme ölçeęi

(Turkish version of the MAF Scale)

Açıklama: Bu sorular, yorgunluk ve yorgunluęun faaliyetleriniz üzerine etkisi ile ilgilidir.

Aşağıdaki sorulardan her biri için, geçtiğimiz 7 gün boyunca neler hissetmiş olduğunuzu en yakından gösteren rakami daire içine alın.

Örneęin: Sabahlari geç saatlere kadar uyumayı gerçekten sevdiğinizi farzedin. Bu durumda muhtemelen çizginin sonundaki “çok fazla” ya yakın bir rakami, sağıda görüldüğü gibi daire içine alırsınız.

Örnek: Sabahlari geç saatlere kadar uyumayı genellikle ne ölçüde seversiniz?

- 1 2 3 4 5 6 7 8 9 10
Hiç Çok fazla

Şimdi lütfen aşağıdaki soruları *geçtiğimiz 7 günü* göz önüne alarak cevaplayınız.

1. Ne derece yorgunluk hissettiniz?

- 1 2 3 4 5 6 7 8 9 10
Hiç Çok fazla

Yorgunluk hissetmediyseniz burada durun.

2. Yaşadığımız yorgunluk hangi şiddetteydi?

- 1 2 3 4 5 6 7 8 9 10
Hafif Ağır

3. Yorgunluk sizi ne ölçüde sikintiya soktu?

- 1 2 3 4 5 6 7 8 9 10
Sikinti yok Çok miktarda sikinti

Yorgunluğun çok boyutlu değerlendirilmesi ölçeği (devamı)

Geçtiğimiz 7 gün içinde yorgunluğun, aşağıda sıralanan faaliyetlerden her birini yapabilmenizi ne derecede engellediğini en iyi gösteren rakami daire içine alın. Geçtiğimiz 7 gün içinde yorgunluk dışındaki nedenlerle yapmadığınız faaliyetler için (örneğin, emekli olduğunuz için işe gitmemek), faaliyetin adının sol yanındaki haneyi işaretleyin.

Geçtiğimiz 7 gün içinde yorgunluk, şunları yapabilmenizi ne derecede engelledi?:

(NOT: Geçtiğimiz 7 gün boyunca yapmadığınız faaliyet varsa ilgili soru numarasının solundaki kutucuğu işaretleyin.)

4. Günlük ev işlerini yürütme

1 2 3 4 5 6 7 8 9 10
Hiç Büyük ölçüde

5. Yemek pişirme

1 2 3 4 5 6 7 8 9 10
Hiç Büyük ölçüde

6. Yikanma ve yıkama

1 2 3 4 5 6 7 8 9 10
Hiç Büyük ölçüde

7. Giyinme

1 2 3 4 5 6 7 8 9 10
Hiç Büyük ölçüde

8. İşyerinde çalışma

1 2 3 4 5 6 7 8 9 10
Hiç Büyük ölçüde

9. Aile ve arkadaşları ziyaret etme veya onlarla sosyal ilişkiler kuma

1 2 3 4 5 6 7 8 9 10
Hiç Büyük ölçüde

(NOT: Geçtiğimiz 7 gün boyunca yapmadığınız faaliyet varsa ilgili soru numarasının solundaki kutucuğu işaretleyin.)

10. Cinsel faaliyetlerle uğraşma

1 2 3 4 5 6 7 8 9 10
Hiç Büyük ölçüde

11. Boş zamanlari değerlendirme ve yenilenme faaliyetleri ile uğraşma

1 2 3 4 5 6 7 8 9 10
Hiç Büyük ölçüde

12. A alışveriş yapma ve ayak işlerini yürütme

1 2 3 4 5 6 7 8 9 10
Hiç Büyük ölçüde

13. Yürüyüş yapma

1 2 3 4 5 6 7 8 9 10
Hiç Büyük ölçüde

14. Egzersiz yapma (yürüyüş dışında)

1 2 3 4 5 6 7 8 9 10
Hiç Büyük ölçüde

15. Geçtiğimiz 7 gün boyunca ne sıklıkta yorgunluk hissettiniz?

- 4 Her gün
 3 Her gün değilse de çoğunlukla
 2 Çoğu gün olmasa da ara sıra
 1 Pek az gün

16. Geçtiğimiz 7 gün boyunca yorgunluğunuz ne ölçüde değişti?

- 4 Arttı
 3 Yorgunluk bazan arttı, bazan azaldı
 2 Aynı kaldı
 1 Azaldı

Copyright of Journal of Back & Musculoskeletal Rehabilitation is the property of IOS Press and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.