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MULTIDIMENSIONAL FATIGUE INVENTORY-20 ADAPTATION FOR CANCER-RELATED-FATIGUE: VALIDITY AND RELIABILITY STUDY INTO TURKISH

KANSERE BAĞLI YORGUNLUKTA ÇOK BOYUTLU YORGUNLUK ENVANTERİ-20'NİN UYARLANMASI: TÜRKÇE GEÇERLİK VE GÜVENİRLİK ÇALIŞMASI

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ABSTRACT

Objective: Cancer-related fatigue (CRF) is one of the most common symptoms in cancer and its treatment. It negatively affects the quality of life of patients. Despite the frequent occurrence of cancer-related fatigue and its negative effects on patients, its physiopathological mechanism is unknown. For the patient's quality of life to improve and the treatment procedure to be successfully completed, daily measurement of tiredness and regular follow-up are crucial. In this study, we aimed to evaluate the validity and reliability of the Multidimensional Fatigue Inventory-20 (MFI-20) in patients undergoing oncological surgery.

Methods: The study was conducted with a total of 200 patients (61.5% who received only surgical treatment) who received oncological treatment (at least surgery) in the general surgery clinics of a university hospital between September 2017-July 2019. The criteria of Beaton et al. were followed for the translation process of the scale. Cronbach's alpha coefficient was calculated for reliability and fatigue was compared with visual analog scale. Confirmatory factor analysis (DFA) was performed to assess the structural validity of the MFI.

Results: The total Cronbach's alpha coefficient was 0.94 (0.74 to 0.94). The CFA showed good construct validity and revealed five dimensions. $\chi 2/df$ value is below 3 (2.216). The overall correlation between MFI and VAS-fatigue was highly significant ($p<0.000$), indicating a strong relationship.

Conclusion: In this study, the Turkish version of the MFI-20 was found to have high internal consistency and appropriate construct validity. The use of MFI-20 for the evaluation of fatigue in individuals who have undergone oncological surgery is valid and reliable.

Keywords: Cancer related fatigue; multidimensional fatigue inventory; reliability; validity.

ÖZ

Amaç: Kansere bağlı yorgunluk, kanser ve tedavisinde en sık görülen semptomlardan biridir. Hastaların yaşam kalitesini olumsuz etkiler. Kansere bağlı yorgunluğun sık görülmesine ve hastalar üzerindeki olumsuz etkilerine rağmen fizyopatolojik mekanizması bilinmemektedir. Hastanın yaşam kalitesinin artması ve tedavi sürecinin başarılı bir şekilde tamamlanması için yorgunluğun günlük olarak ölçülmesi ve düzenli takip edilmesi büyük önem taşımaktadır. Bu çalışmada, Çok Boyutlu Yorgunluk Envanteri-20'nin (MFI-20) onkolojik cerrahi geçiren hastalarda geçerlilik ve güvenilirliğini değerlendirmeyi amaçladık.

Yöntem: Araştırma Eylül 2017- Temmuz 2019 tarihleri arasında bir üniversite hastanesinin genel cerrahi kliniklerinde onkolojik tedavi alan (en az cerrahi geçiren) toplam 200 hasta (sadece cerrahi tedavi alan %61,5) ile gerçekleştirildi. Ölçeğin çeviri işlemi için Beaton ve ark.'nın kriterleri izlendi. Güvenirlik için Cronbach alfa katsayısı hesaplandı ve yorgunluk görsel analog skala karşılaştırıldı. MFI'nin yapısal geçerliliğini değerlendirmek için Doğrulayıcı faktör analizi (DFA) yapıldı.

Bulgular: Toplam Cronbach alfa katsayısı 0.94 (0,74 ile 0,94) bulundu. DFA iyi bir yapısal geçerlilik gösterdi ve beş boyut ortaya çıkardı. $\chi 2/df$ değeri 3'ün altındadır (2.216). MFI ve VAS-yorgunluk arasındaki tüm korelasyon ileri derecede anlamlıydı ($p<0,000$) ve bu da güçlü bir ilişkiyi göstermektedir.

Sonuç: Bu çalışmada, MFI-20'nin Türkçe versiyonunun yüksek bir iç tutarlılığa ve uygun yapı geçerliliğinin olduğu belirlendi. Onkolojik cerrahi geçirmiş bireylerde yorgunluğun değerlendirilmesi için MFI-20 kullanımı geçerli ve güvenilirdir.

Anahtar Kelimeler: Kansere bağlı yorgunluk; çok boyutlu yorgunluk envanteri; güvenilirlik; geçerlilik

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Introduction

Cancer is an important health problem worldwide.[1] One of the most prevalent symptoms of cancer and cancer therapy is Cancer related fatigue (CRF). Patients' quality of life is adversely affected.[2,3] CRF can develop suddenly, unlike the fatigue characteristics experienced by healthy individuals. It is disproportionate to effort, and relaxation is not available with rest and sleep.[3] The prevalence of total CRF in patients diagnosed with cancer is 14.3%-100%, treatment-related CRF is between 80-90%.[4-7] The incidence of this symptom may vary according to the definitions, criteria for evaluation as fatigue, cancer type, and anti-cancer treatment.[8,9] Fatigue causes deterioration in patients' quality of life, often associated with weakness, loss of energy, physiological and psychological changes.[10] Patients often describe fatigue using different expressions such as weariness, weakness, and lack of energy.[11,12] National Comprehensive Cancer Network (NCCN), on the other hand, defines fatigue as an uncomfortable, persistent, subjective feeling of weariness or exhaustion that is out of proportion to recent activity related with cancer and cancer treatment and interferes with normal life.[8,13]

Despite the frequent occurrence of CRF and its negative effects on patients, its physiopathological mechanism is unknown. Its pathogenesis consists of complex and multifactorial mechanisms involving the interaction of dynamic, clinical process, and cognitive, emotional, psychosocial, and somatic factors.[8,9] In people with cancer, weakness can be caused by surgery, abnormal blood values, and electrolyte levels, infection, and hormonal changes. Often, fatigue develops due to cancer and its treatment, as there are many comorbid factors involved.[14] It has been reported that variables such as changes in protein and hormone levels associated with the inflammatory process, increase in the amount of energy spent to remove metabolic wastes from the body after anticancer treatment, production of toxic substances by cancer, skeletal muscle loss, desynchronization of circadian rhythms, change in cytokine levels (primarily proinflammatory cytokines), depression, anemia, cachexia, and hypothyroidism are effective on cancer fatigue.[15-17]

For the patient's quality of life to improve and the treatment procedure to be successfully completed, daily measurement of tiredness and regular follow-up are crucial. It is observed that in the literature, multidimensional scales have been developed to evaluate the cognitive, emotional, and psychosocial characteristics of fatigue.[18-20]

Scales evaluating fatigue in the literature generally evaluate it with either quantitative or qualitative measurements in the psychological or physiological dimension. There are multiple variables in the etiology of cancer fatigue. All these evaluation tools are difficult and impossible to use in daily practice. In routine practice, the diagnostic process of fatigue is similar to the assessment of pain, which is subjective data.[4] Therefore, nurses need a brief assessment tool to evaluate the fatigue status of cancer patients.[21] For this reason, we aimed to establish the Turkish language and content The Multidimensional Fatigue Inventory (MFI) scale's reliability and validity, which includes the evaluation of different dimensions of cancer-related fatigue, based on the information provided.

Methods

Study Design

The study was conducted in descriptive type.

Setting and Samples

Patients who underwent cancer surgery in the university hospital in Istanbul between September 2017 and July 2019 participated in this study. After explaining the content and purpose of the study to the participants, the patients who met the research criteria and gave consent to participate in the study constituted the sample.

The G Power (3.1.9.2) (Kiel University, Germany) application was used for power analysis to calculate the sample size. As a result of the power analysis, the difference between the primary treatment groups in terms of Multidimensional Fatigue Inventory (MFI) score was found to be type 1 error: p<.05, sample size=200, and power level was .86 according to effect size =.253.

Patients who were adults (≥18 years), and had cancer of lung, liver, gastric, colorectal, pancreatic, kidney, bladder, breast and underwent elective cancer surgery under general anesthesia and had no disabilities and could read, write, understand, and speak Turkish that could affect the interview, and were accepted to participate in the study. Patients who had undergone thyroid cancer surgery (it will affect the level of fatigue metabolically) and had a neurological disorder and were administered drugs that could affect severe cognitive or communication deficits were excluded from the study.

Ethical Considerations

Ethical approval (no: 368415/04.10.2017) from the Istanbul University Cerrahpasa Clinical Research Ethics Committee, and institutional permission (no: 192686/22.05.2017) were obtained to conduct the study. A face-to-face questionnaire was used to gather the data. It was explained to the patients that answering the questionnaire was completely voluntary. The patients gave their verbal and written agreement to take part in the study. In addition, permission was obtained from the author to use the scales in the study.

Study Protocol

Patients

Data such as socio-demographic characteristics of the patients, diagnosis of the disease and surgical intervention, date of diagnosis, primary treatment method (surgery, chemotherapy, radiotherapy), treatment methods applied at the time of the study, recurrence status, presence of metastasis, date of

surgical intervention, type of surgical intervention, completion time of surgical intervention were recorded.

Language Equivalence and Content Validity of the Scale

For the translation of the scales, the criteria of Beaton et al. (22) were followed.

In the first stage of the pilot testing process, two translators and two other researchers, who were informed about the purpose of the process, assessed the MFI's original English version and its translation into Turkish to ensure conceptual similarity. Differences in the translation results of the scale items were arranged by consensus. To assess the content validity of the scale, a team of five experts in the field of oncology and surgical oncology (1 internal medicine nurse, 2 surgical nurses, and 2 general surgeons) evaluated the content validity of the scale and found that the “content validity ratio” and “content validity index” values of the two scales were 1. Then, the Turkish version of the scale was completed before the pilot study.

This the version was tested in pilot group of 20 patients. Before issuing the final version of the scale, it was ensured that the patients had similar demographic characteristics. Patients were asked which items they had difficulty understanding and answering. All patients were able to complete the questionnaire on their own without intervention. There were no negative comments from patients after the test. Therefore, a major change was not considered necessary. These 20 questionnaires were not included in the study. The patients' questionnaire was completed in an average of 10 minutes.

Construct Validity and Reliability

Confirmatory factor analysis (CFA) was performed to evaluate the construct validity of the MFI. The CFA findings indicated that the standard values of each item's corresponding factors were all significantly large (>0.70). Many fit indices are used for confirmatory factor analysis. In this study, $\chi 2/df$, RMSEA, SRMR, CFI, and GFI were examined.

Reliability is the stability of the measurement values of a measurement tool as a result of repeated measurements under the same conditions. In the “Reliability Analysis” applied to test the reliability of the scale in this study, the internal consistency reliability of the scale was calculated by considering the item total score correlation and Cronbach's alpha coefficient. Test-retest method was not used to ensure reliability. Because in this study, the fatigue status of patients undergoing oncologic surgery was evaluated and it was not found appropriate to measure at the time interval suitable for test-retest (2 to 4 weeks later).

In clinical practice, VAS is often used to assess fatigue. To assess the subscales in the scale, cut-off points from the study by Baussard et al. (21), which assessed fatigue in a similar sample group to the present study, were used. According to this study, the lower limit of “0” on the scale indicates no fatigue, while the upper limit of “10” indicates extreme fatigue. Patients were asked about their fatigue, weakness and exhaustion levels separately while applying the VAS scale. The threshold was 5.5 cm for physical fatigue and 7 cm and above for psychological fatigue. The MFI's Cronbach's alpha in this study was 0.946 and the item total correlation values were 0.292-0.833 (min-max).

Statistical Analysis

The study was carried out on 200 subjects. The data were analyzed with IBM SPSS Statistics 25 and IBM SPSS AMOS 25 programs. While evaluating the study data, frequency distribution for categorical variables and descriptive statistics for numerical variables were given. Independent samples t test was used to determine whether there were differences in MFI and VAS scores. One Way ANOVA was used to determine whether there was a difference between more than two groups. As a result of "one-way analysis of variance" (ANOVA), Levene's test was used for homogeneity of variance. Then, which group or groups the difference originated from was checked with the "multiple comparison test" (Bonferroni or Tamhane's T2). The Bonferroni test was used to examine the difference between the groups in the variables that provided variance homogeneity, and Tamhane's T2 test was used to examine the difference between the groups in the variables that did not provide the variance homogeneity. The results were presented in tables using confirmatory factor analysis for scale validity and Cronbach's alpha value for reliability and Pearson correlation analysis for the relationship between domains.

Results

Fifty percent of the patients were female, mean age was 53.26±13.00, mean BMI was 27.08±5.57, 86.5% were married, 31.5% were primary school graduates, 35% were retired, 50% were smoking, and 18.5% consumed alcohol. We assessed whether the type of cancer, time since diagnosis, type of treatment and type of surgical intervention affected patients' fatigue levels. We found that there was a significant correlation between the mean VAS scores for cancer, treatment type and type of surgical intervention and the mean MFI scores for treatment type (Table 1).

Construct Validity of the Scale

The internal consistency of the factors (total Cronbach’s α coefficient: 0.946) was higher than 0.70. The Cronbach's α coefficients of each of the five subscales of the MFI-20 range between 0.74 and 0.94. An item-total score correlation coefficient of 0.30 and above is interpreted as good for reliability. It was decided in this study not to remove any item in the scale since no item was found to be below 0.30 and no item in the item analysis significantly changed the Cronbach's α value when any item was deleted (Table 2).

Table 1. Distribution of Participants' Socio-demographic and Disease Characteristics

		N	%
Gender	Woman	101	50,5
	Man	99	49,5
Age (Mean±SD)		53,26±13,00	
BMI (Mean±SD)		27,08±5,57	
Marital status	Married	173	86,5
	Single	27	13,5
Education levels	Illiterate	8	4,0
	Literate	12	6,0
	Primary education	63	31,5
	High school	63	31,5
	University	53	26,5
	Graduate	1	0,5
Working status	Working	55	27,5
	Unemployed	19	9,5
	Retired	70	35,0
	Housewife	56	28,0
Cigaret	Yes	100	50,0
	No	100	50,0
Alcohol	Yes	37	18,5
	No	163	81,5

		N	%	VAS	MFI	p^1	p^2
				Mean±SD	Mean±SD		
Type of cancer	Colorectal cancer	70	35,0	5,62±2,55[b]	67,39±17,81	**.012***	.444
	Breast cancer	33	16,5	6,73±2,28	74,58±15,69		
	Gastric cancer	28	14,0	5,95±2,00	67,07±15,39		
	Pancreatic cancer	20	10,0	7,26±2,01	70,20±17,67		
	Lung cancer	16	8,0	7,31±1,42[a]	68,94±16,43		
	Kidney cancer	13	6,5	6,83±1,53	69,08±16,83		
	Bladder cancer	12	6,0	7,03±1,86	62,08±16,66		
	Other*	8	4,0	6,85±1,43	71,25±16,31		
Time after diagnosis	Less than 2 years	154	77,0	6,28±2,32	67,45±16,10	.552	.086
	2-5 years	35	17,5	6,74±1,68	73,37±17,63		
	More than 5 years	11	5,5	6,25±2,70	74,64±21,94		
Type of treatment	Surgical treatment	123	61,5	5,96±2,45[b]	65,76±16,25[b]	**.004***	**.001***
	Surgery+chemotherapy	43	21,5	7,16±1,60[a]	71,63±15,80		
	Trimodal treatment**	34	17,0	6,81±1,78	76,71±17,51[a]		
Type of intervention	Open surgical intervention	165	82,5	6,65±2,06	69,95±16,42	**.001***	.052
	Closed surgical intervention	35	17,5	4,99±2,57	63,86±18,09		

*Lymphoma=2, Uterine Cancer=1, Prostate Cancer=5 **Trimodal treatment: Surgery+radiotherapy+chemotherapy, [1]:VAS, [2]:MFI

Table 2. MFI-20 and Sub-Scales Reliability

Sub-Scales of MFI-20	Item	Item-total correlation	Cronbach's Alpha (if the item is deleted)	Cronbach's alfa	
General fatigue	mfi15	0,813	0,942	0,947	**0,946**
	mfi12	0,789	0,942		
	mfi14	0,833	0,941		
	mfi4	0,793	0,942		
	mfi3	0,755	0,942		
	mfi38	0,763	0,942		
	mfi20	0,708	0,943		
	mfi40	0,697	0,943		
Physical fatigue	mfi21	0,481	0,945	0,826	
	mfi22	0,608	0,944		
	mfi24	0,577	0,944		
	mfi1	0,443	0,946		
	mfi25	0,538	0,945		
Reduced activity	mfi19	0,610	0,944	0,851	
	mfi16	0,751	0,942		
	mfi2	0,599	0,944		
	mfi17	0,610	0,944		
	mfi11	0,526	0,945		
	mfi29	0,727	0,943		
Reduced motivation	mfi18	0,292	0,947	0,745	
	mfi32	0,594	0,944		
	mfi33	0,504	0,945		
	mfi30	0,328	0,947		
	mfi28	0,600	0,944		
	mfi27	0,369	0,946		
Mental fatigue	mfi34	0,550	0,944	0,849	
	mfi35	0,553	0,944		
	mfi26	0,592	0,944		

CFA was used to assess the scale's construct validity. *In the first stage*, a path model with 5 factor-dimensions as latent variables (general fatigue-f1, physical fatigue-f2, reduced activity-f3, reduced motivation-f4, mental fatigue-f5) and the statements constituting these factors as indicator variables was created in **Figure 1.** Since latent variables are not metric, to estimate parameter values, a value of 1 (factor loading equal to 1) is assigned to the observed (indicator) variables from the latent variables.[25]

		General.F.	Physical.F.	R.activity	R.motivation	Mental.F.	MFI
General fatigue	r	1	**.70**	**.63**	**.67**	**.70**	**.87**
	p		**.000**	**.000**	**.000**	**.000**	**.000**
Physical fatigue	r		1	**.65**	**.71**	**.55**	**.85**
	p			**.000**	**.000**	**.000**	**.000**
Reduced activity	r			1	**.77**	**.54**	**.84**
	p				**.000**	**.000**	**.000**
Reduced motivation	r				1	**.59**	**.88**
	p					**.000**	**.000**
Physical fatigue	r					1	**.80**
	p						**.000**
MFI	r						1
	p						

r:Pearson correlation coefficient. **F:Fatigue R: Reduced**

In the second stage, the maximum likelihood method was used to estimate the model so that the parameters including the errors of the observed variables, the variances of the latent variables and the regression coefficients of the paths drawn from the latent variables to the observed variables could be estimated. In order to improve the fit indices, a two-way relationship was established between the error terms of the questions “mfi5” and “mfi16”, “mfi10” and “mfi17”, “mfi15” and “mfi18”, “mfi7” and “mfi11”, and “mfi13” and “mfi19” in the multidimensional fatigue inventory scale, which had the highest modification indices (Table 3).

Table 3. Models of fit indexes and acceptable value ranges used in the study

Indexes	Perfect fit criteria	Acceptable compliance criteria	The findings	Conclusion
χ2/df	0	3≤χ2/df≤5	2.216	Perfect appropriate
RMSEA	0.00≤RMSEA≤0.05	0.05≤RMSEA≤0.08	0.078	Acceptable
SRMR	0.00≤SRMR≤0.05	0.05≤SRMR≤0.10	0.065	Acceptable
CFI	0.95≤CFI≤1.00	0.85≤CFI	0.886	Acceptable
GFI	0.95≤TLI≤1.00	0.85≤TLI	0.860	Acceptable

References: RMSEA (26), SRMR: (27), CFI ve TLI: (28-31).

All components have a substantial standard estimate of their respective factors (>0.70), according to the Turkish MFI's CFA findings. The standardised values for overall fatigue, physical fatigue, mental fatigue, reduced activity, and reduced motivation varied from 0.71 to 0.81, 0.70 to 0.76, 0.72 to 0.84, and 0.70 to 0.84, respectively. Additionally, the model showed a strong match to the data. The relationship between the subscales is not significant, indicating that all five factors are different from each other. The minimum values of Chi-Square divided by the degree of freedom (χ2/df) were below 3 (2.216), RMSEA below 0.08 (0.078), SRMR below 0.10 (0.065), and CFI (0.886) and GFI above 0.85 (0.860).

Table 4. Investigation of the relationship between multidimensional fatigue inventory and VAS scores

		General fatigue	Physical fatigue	Reduced activity	Reduced motivation	Mental fatigue	MFI
VAS fatigue	r	.56	.37	.29	.31	.43	.46
	p	.000	.000	.000	.000	.000	.000
VAS weakness	r	.57	.38	.27	.32	.45	.47
	p	.000	.000	.000	.000	.000	.000
VAS exhaustion	r	.61	.37	.35	.32	.51	.51
	p	.000	.000	.000	.000	.000	.000

r: Pearson correlation coefficient

Reliability Study of the Scale

Cronbach's Alpha values of the scale showed a total reliability of .94. In this study, only item-18 was found to be below .30, however, it was decided not to remove any item from the scale because it did not significantly affect the Cronbach's Alpha value when removed (Table 2).

In the reliability analysis of the scale, since the test-retest method was not suitable for the evaluation of the sample group, the VAS scale similar to the MFI was used. In our study, there was a strong correlation between the MFI subscales and the mean VAS scores, which separately assessed patients' fatigue, weakness and exhaustion (Table 4).

Evaluation of the Scale

The scale includes five subscales (general fatigue, physical fatigue, reduced motivation, reduced activity and mental fatigue) and 20 questions. The subscales include four questions with two positive and two negative statements. The questions are scored on a five-point scale from "1=yes, this is correct" to "5=no, this is incorrect". The total score of the scale is calculated as the sum of the scores given to each item of the scale. Scores range from a minimum of 4 to a maximum of 20 in each subscale and the maximum total score is a minimum of 20 and a maximum of 100. A higher score indicates increased fatigue.

Discussion

Fatigue is one of the most disabling sign for patients undergoing oncologic treatment and needs a powerful tool that enables detailed measurement for clinical assessment of patients.[19,20] Evidence on questioning and managing fatigue levels of oncology patients during the clinical assessment process is available in the literature.

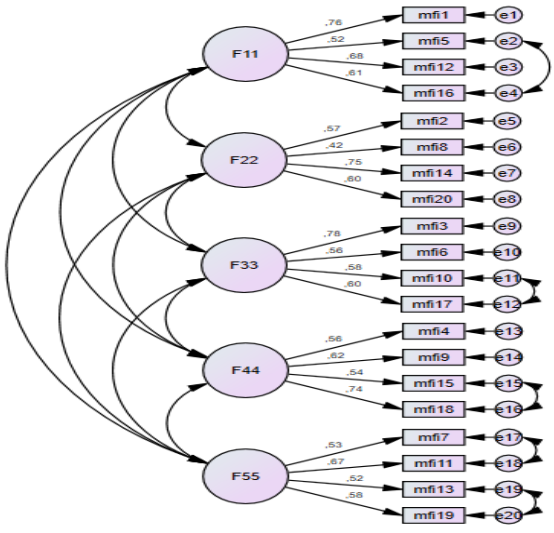

Figure 1. Path Model

Fatigue refers to a multidimensional concept that includes social, physical, psychological aspects. Therefore, healthcare professionals need to evaluate patients with comprehensive tools. MFI is a useful scale that evaluates the impact and severity of fatigue on the patient.[23] The VAS is a short and easily applicable assessment tool that is very easy to use,[21] however, the MFI allows for a formal assessment of fatigue.

In this context, we tried to develop the Turkish form of MFI, which can evaluate the fatigue of oncology patients. The authors of the original article recommended using the English version rather than the Polish, French, Chinese and Brazilian versions in cultural adaptation studies. When developing a valid Turkish version of the MFI, we used the forward-backward translation method and aimed to preserve the original meaning of the items. It was determined that the Turkish version was an easy-to-understand tool and no changes were required. Cronbach Alpha values of the Turkish MFI showed a total reliability of .94. It is in parallel with the results of the French study conducted with a similar sample group.[24] Cronbach's α values of the Turkish five-factor model indicate that this version has good internal consistency (range: 0.74-0.94). The results of the CFA analysis for construct validity support the five-factor model. Accordingly, the factor loadings of all items were above 0.7; therefore, there was no need to remove any item from the scale. Chi-square and RMSEA values also showed that the fit to the data was good. The study results were found to have five dimensions, as in the CFA result of the Hindi version of MFI-20.[25] Physical and general fatigue aspects were not identified in the other versions of the MFI-20.[26-29] In Filion et al's version, cancer-related fatigue was assessed and four dimensions (general and mental fatigue, reduced activity and motivation) were obtained. Physical and general fatigue resulted from both.[24] Smets's study is reported that the four-factor model is as acceptable as the five-factor model, so these two values can be combined.[30] Similarly for the Swedish version, the researchers report that these values can be combined.[31] It also supports the results of research evaluating the fatigue level of patients with fibromyalgia.[23] Cancer-related fatigue is a concept that includes not only physical fatigue but also mental fatigue. The psychological fatigue of oncology patients seriously affects their treatment compliance, pain perception and quality of life. The Turkish oncology version of the MFI-20 has strong construct validity and multidimensional evaluation of fatigue in cancer patients was supported. In this study, we questioned patients' levels of fatigue, weakness and exhaustion using VAS and assessed the physical and psychological aspects of the MFI-20. There were strong correlations between the VAS and all subscales of the Turkish MFI-20 ($p<0.01$). Similar to our study, Smets et al.[30] also reported a strong correlation between general fatigue and VAS in the original MFI-20.

In conclusion, Turkish MFI-20 oncology version makes an important contribution to the literature on nursing care in the fatigue assessment process of cancer patients. The five-dimensional model of the Turkish MFI-20 used in oncology patients has sufficient internal consistency and construct validity, with its item-total correlation value and Cronbach's alpha value being high. The Turkish MFI-20 oncology version is a valid and reliable tool for the multidimensional assessment of fatigue in cancer patients.

Limitations of the research: The Turkish validity and reliability study of the MFI Scale was conducted in a single center and on patients receiving multimodal (surgery, radiotherapy, chemotherapy) cancer treatment. This situation disrupts the homogeneity of treatment-related fatigue levels and characteristics of the patients in the study sample.

What this paper adds?

• Multidimensional Fatigue Inventory is a valid and reliable instrument for determining the symptom profile of patients undergoing cancer surgery, chemotherapy radiotherapy and multimodal treatment.

The implications of this paper:

• Multidimensional Fatigue Inventory is an easy to answer numeric rating instrument that has the potential to be included in clinical practice settings to achieve a more comprehensive and objective assessment of the symptom experience.

Compliance with Ethical Standards

Ethical approval (no: 368415/04.10.2017) from the Istanbul University-Cerrahpasa Clinical Research Ethics Committee, and institutional permission (no: 192686/22.05.2017) were obtained to conduct the study. Informed consent was obtained from all participants.

Conflict of Interest

The author declares no conflicts of interest.

Author Contribution

YÖ, DK: Idea generation; YÖ, DK, NK, EG: Literature review; GC, YÖ, DK, EG: Study design; YÖ, DK, SMÖ: Data collection; GC, YÖ, AT: Statistics//analysis; GC, YÖ, AT: Interpretation of the results; GC, YÖ AT, SMÖ: Writing of the article.

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