




## Turkish version of the Massachusetts General Hospital Cognitive and Physical Functioning Questionnaire: A reliability and validity study

Mehmet Alptekin Karaçesme<sup>1</sup> , Manolya İlhanlı<sup>2</sup> , İlker İlhanlı<sup>1</sup> 

<sup>1</sup>Department of Physical Medicine and Rehabilitation, Ondokuz Mayıs University Faculty of Medicine, Samsun, Türkiye

<sup>2</sup>Department of Dentomaxillofacial Radiology, Ondokuz Mayıs University Faculty of Dentistry, Samsun, Türkiye

**Correspondence:** Manolya İlhanlı, MD.

**E-mail:** manolya\_dmrcn@hotmail.com

**Received:** May 16, 2023

**Accepted:** October 26, 2023

**Published online:** March 20, 2024

**Citation:** Karaçesme MA, İlhanlı M, İlhanlı İ. Turkish version of the Massachusetts General Hospital Cognitive and Physical Functioning Questionnaire: A reliability and validity study. Arch Rheumatol 2024;39(x):i-ix. doi: 10.46497/ArchRheumatol.2024.10337.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes (<http://creativecommons.org/licenses/by-nc/4.0/>).

### ABSTRACT

**Objectives:** This study aimed to analyze the validity and reliability of the Turkish version of the Massachusetts General Hospital Cognitive and Physical Functioning Questionnaire (CPFQ) in patients with fibromyalgia (FM) syndrome by translating and culturally adapting the CPFQ to Turkish.

**Patients and methods:** One hundred seventeen patients (8 males, 109 females; mean age: 47.4±12.4 years; range, 18 to 77 years) diagnosed with FM according to the 2016 American College of Rheumatology FM diagnostic criteria between May 2021 and August 2021 were included in the reliability and validity study. The CPFQ was translated into Turkish, the intelligibility of the obtained Turkish version was evaluated by five patients and five healthcare professionals, and the final form of the questionnaire was prepared. Mini-mental state examination (MMSE), Fibromyalgia Impact Questionnaire (FIQ), and Hospital Anxiety and Depression Scale (HADS), which were proven to be reliable and valid in Turkish, were administered to the patients. For test-retest reliability, the Turkish version of the CPFQ was filled in two times with an interval of one week. Internal consistency was evaluated by calculating Cronbach's alpha. Validity was evaluated by looking at the correlations between the total score obtained from the Turkish version of CPFQ and the MMSE score, HADS depression and anxiety scores, and FIQ score.

**Results:** In the evaluation of internal consistency, Cronbach's alpha was found to be high in all subgroups. In test-retest reliability, intraclass correlation coefficient was high in CPFQ subgroups. The CPFQ showed a significant positive correlation with HADS depression and a moderately positive correlation with HADS anxiety and FIQ. A significant but weak negative correlation was detected between CPFQ and MMSE. While there was no significant correlation between MMSE and FM disease activity and HADS anxiety, there was a significant but weak negative correlation between HADS depression.

**Conclusion:** In this study, the Turkish version of CPFQ was shown to have high reliability and validity in FM patients. It was concluded that CPFQ could be applied to Turkish patients with FM.

**Keywords:** Cognitive function, fibromyalgia, questionnaire, reliability, validity.

Fibromyalgia (FM) syndrome is a chronic disease that is not fully known, characterized by widespread pain and tender points in the musculoskeletal system, accompanied by sleep and mood disorders, weakness, and cognitive dysfunction.<sup>1,2</sup> FM prevalence varies according to the diagnostic criteria applied and is an average of 2.7% in the overall population (4.1% in females and 1.4% in males).<sup>3</sup> Although there is no clear cause to explain etiopathogenesis in FM, various mechanisms have been proposed. It is thought that the disease depends on multiple causes, and research continues.<sup>4,5</sup>

Widespread musculoskeletal pain is the most fundamental clinical finding of FM. Although pain is more common in body areas such as the neck, shoulder, hips, and thighs, it is usually available in the whole body.<sup>6</sup> Morning stiffness is one of the clinical findings in 73 to 85% of FM patients.<sup>1</sup> Patients complain about soft tissue and joint swelling that cannot be shown objectively.<sup>7</sup> Sleep disorder is one of the common symptoms in FM, usually in the form of difficulty in falling asleep and waking up at night.<sup>8,9</sup> Fatigue is one of the main findings in FM, and physical activity increases the severity of fatigue.<sup>1,7</sup> In patients with

FM, complaints in the form of numbness and tingling in the extremities may be encountered.<sup>10</sup>

Cognitive functions, such as focus, attention, and memory, are affected in patients diagnosed with FM.<sup>11,12</sup> Problems with memory and focus are called fibrofog.<sup>13</sup> In a study that compared patients with FM and non-FM individuals with a mild cognitive disorder, patients diagnosed as FM were found to be impaired in cognitive functions, such as attention and memory, similar to patients with mild cognitive disorder.<sup>14</sup> In another study, cognitive dysfunctions such as difficulty in remembering and mental confusion were found to be significantly more frequent in patients with FM and additional rheumatic diseases than in patients with only rheumatic diseases.<sup>15</sup> Memory problems in FM may be significant enough to disrupt the daily work performance of the patients.<sup>13</sup>

When we look at the studies on attention, it was found that there was a deficiency in cases that required more attention in a study compared to the control group in patients with FM.<sup>16</sup> In another study, it was found that FM patients perform worse in maintaining concentration and memory compared to the control group.<sup>17</sup> Cognitive symptoms increase with pain, anxiety, depression, and sleep disorders, but the relationship as a mechanism cannot be fully explained.<sup>18,19</sup>

Fibromyalgia syndrome is a common disease,<sup>7</sup> and physical and cognitive dysfunction can accompany the disease.<sup>20,21</sup> FM diagnostic criteria include cognitive dysfunction, and evaluating cognitive functions is important in terms of correct diagnosis and determination of the severity of the disease.<sup>6</sup> Although there are scales that evaluate physical or cognitive dysfunctions in this disease, it is time-consuming and not practical.<sup>21-23</sup> In FM, more practical scales are needed to evaluate physical and cognitive function.

Massachusetts General Hospital Cognitive and Physical Functioning Questionnaire (CPFQ), developed in 2009 by Fava et al.,<sup>24</sup> is a scale that has been shown to be valid and reliable and is easy to implement. To the best of our knowledge, there is no study that examined the reliability and validity of the Turkish version of CPFQ. Furthermore, there is no study conducted with FM patients. Hence, this study aimed to analyze

the validity and reliability of the Turkish version of CPFQ in patients with FM by translating and culturally adapting the CPFQ to Turkish.

## PATIENTS AND METHODS

One hundred seventeen patients (8 males, 109 females; mean age:  $47.4 \pm 12.4$  years; range, 18 to 77 years) admitted to the Ondokuz Mayıs University Faculty of Medicine Department of Physical Medicine and Rehabilitation diagnosed as FM according to the 2016 American College of Rheumatology FM diagnosis criteria between May 2021 and August 2021 were included in the reliability and validity study. The subject number was determined according to Nunnally's<sup>25</sup> study. Nunnally<sup>25</sup> described the number of ideal subjects for such validity and reliability studies as 10 subjects per item. There are seven items in CPFQ. However, we aimed to take at least 15 patients per item, taking into account the possible abandonment of the study. As a result, approximately 16 subjects per item were included in our study. Patients who had been previously diagnosed with cognitive disorders and patients with psychiatric diagnoses were excluded from the study.

Mini-mental state examination (MMSE), Fibromyalgia Impact Questionnaire (FIQ), and Hospital Anxiety and Depression Scale (HADS) were applied to patients. To examine test-retest reliability, Turkish version of CPFQ was filled two times with an interval of one week, and the time to fill the questionnaire was recorded. Within the last week before retest, patients who declared that there was a change in the clinical situation, patients with a change in the clinical situation observed by the clinician, patients with medication changes, and patients who did not want to participate in the retest were excluded from the test-retest study. All items and total score were evaluated by calculating the intraclass correlation coefficient (ICC). The internal consistency, which is the consistency between items, was evaluated with Cronbach's alpha. Construct validity was evaluated by Spearman and Pearson correlation analysis between the total score of the Turkish version of CPFQ and the MMSE score, HADS depression and anxiety scores, and the FIQ score.

CPFQ is a valid and reliable scale that evaluates cognitive and physical functioning and is a survey consisting of seven questions measured by a 6-point Likert scale. A score of 1 shows better function than normal, while 2 shows the normal function, and the function becomes worse as the number increases. A minimum of 7 and a maximum of 42 points can be obtained. In the questions, motivation, alertness, energy, focus, recall, ability to find words, and mental sharpness are examined in the last month. In the literature, there is no other validity and reliability study except for the original scale development study<sup>24</sup> and a study where the CPFQ was used to evaluate different antidepressants.<sup>26</sup> Furthermore, it has not been evaluated on FM patients before. Permission was obtained from the author to develop the Turkish version of CPFQ and use it in our study.

The FIQ is a questionnaire specific to FM, which evaluates the severity of the disease and loss of ability. It was developed in the 1980s by Oregon Health & Science University.<sup>27</sup> It is a survey of 10 questions. Reliability and validity of the Turkish version was proven by Sarmer et al.<sup>28</sup>

Mini Mental State Examination is a commonly used cognitive screening test. Developed by Folstein et al.,<sup>29</sup> it consists of five subsections, and its application lasts about 8 to 16 min. The subsections consist of time and space orientation, recording memory, attention, concentration, recall, and language areas. It is scored by collecting the scores obtained from each item.<sup>30</sup> Güngen et al.<sup>30</sup> found the Turkish version reliable and valid.

Hospital Anxiety and Depression Scale is a 14-item scale created by Zymond and Snaith<sup>31</sup> in 1983. Seven of the questions evaluate the symptoms of anxiety, and the other seven assess depression symptoms. The Turkish reliability and validity study was conducted by Aydemir<sup>32</sup> in 1997. As a result of this study, the cutoff point was found as 7 for depression and 10 for anxiety subscales. Those who score above these points are considered at risk.<sup>32</sup>

The protocol proposed by the Beaton et al.<sup>33</sup> was implemented for translation. The original CPFQ was translated from English to Turkish by two researchers. These translations were evaluated together, and an agreement was reached in a common Turkish text. This version was

back-translated to English independently by two individuals, one from the health sector and the other an English linguist from outside the health sector. The research team evaluated whether there was inconsistency between the Turkish version, the back-translated English version, and the original English version. The comprehensibility of the Turkish version was evaluated by five patients and five health workers, and there was no need for cultural adaptation.

### Statistical analysis

IBM SPSS version 22.0 software (IBM Corp., Armonk, NY, USA) was used for all analyses. The data were evaluated in terms of normality using the Kolmogorov-Smirnov test. The ICC and confidence interval (CI) were used to evaluate the test-retest reliability. The internal consistency measures how well all the items of a scale are related to each other, and the more compliant with each other, the higher the correlation. High correlations between items predict that all items measure the factor of interest. Cronbach's alpha, a measure of the reliability of the scale, was used to evaluate the internal consistency of the questionnaire. To determine possible floor effect and ceiling effect, the maximum and minimum scores of the scale were found, and their percentages were calculated. The construct validity was tested with the Spearman and Pearson correlation coefficient analysis by evaluating the correlations between the total score of the Turkish version of the CPFQ and the MMSE score, the HADS scores, and the FIQ score. A value between 0 and 0.25 was considered no or weak correlation, a value between 0.26 and 0.50 was accepted as moderate correlation, a value between 0.51 and 0.75 was considered good correlation, and a value between 0.76 and 1.00 was considered very good correlation.<sup>34</sup> In terms of the frequency of the variables, the difference between sexes was analyzed by the chi-square test. A p-value <0.05 was accepted as statistically significant.

## RESULTS

The participation in all tests was 100%; CPFQ, MMSE, HADS, and FIQ were completed by all of the 117 patients included in the study. The number of patients who participated in test-retest study

**Table 1.** Demographic variables (n=117)

	Female		Male	
	n	%	n	%
Education				
Primary school	53	48	4	0.07
High school	27	24.7	2	0.06
University	24	22.1	2	0.08
Literate	5	4.3	-	-
Marital status				
Married	98	89.6	7	0.07
Single	11	10.2	1	0.08
Diagnosis				
FM	71	67.4	8	0.01
FM + other diseases (hypertension, diabetes mellitus, osteoarthritis, etc.)	38	32.5	-	-
Medication for FM				
No medication	1	0.9	-	-
Duloxetine	66	59.7	4	0.05
Pregabalin	16	17.0	4	0.02
Gabapentin	4	3.4	-	-
Amitriptyline	4	3.4	-	-
Other antidepressants, antidepressants + duloxetine, antidepressants + pregabalin	7	6	-	-
Duloxetine + pregabalin	13	11.1	-	-
Duloxetine + gabapentin	1	0.9	-	-

FM: Fibromyalgia syndrome.

was 110 (94%). The mean age of female patients was  $47.4 \pm 12.39$  years, while the mean age of male patients was  $47.5 \pm 14.04$  years ( $p=0.693$ ). There was no difference between female and male patients in terms of education, marital status, the presence of a disease accompanying FM, and the medication used for FM ( $p=0.940$ ,  $p=0.591$ ,  $p=0.052$ , and  $p=0.917$ , respectively). Demographic data of the patients are shown in Table 1.

The median value of the FM complaint duration was 60 (3-336) months. This value was 60 (3-336) months for females, while it was

30 (7-72) months for males. In females, the FM complaint duration was significantly longer than in males ( $p=0.001$ ).

The total score of CPFQ did not have a floor (0%) and ceiling (0%) effect. The scores of the evaluation scales applied to patients are shown in Table 2.

The mean completion time of CPFQ was determined as  $2.3 \pm 1.1$  min. The Cronbach's alpha value was 0.796 for the CPFQ, and the ICC value was 0.781 (95% CI: 0.710-0.839). Table 3 demonstrates Cronbach's alpha, ICC, and CI values of each item.

**Table 2.** Scores of the evaluation scales applied to patients

	Mean $\pm$ SD	Median	Min-Max
CPFQ		22	9-38
Fibromyalgia impact questionnaire	52.33 $\pm$ 19.91		
HADS anxiety		8	0-23
HADS depression		5	0-22
Mini mental state examination		24	11-30

SD: Standard deviation; CPFQ: Massachusetts General Hospital Cognitive and Physical Functioning Questionnaire; HADS: Hospital Anxiety and Depression Scale.

**Table 3.** Cronbach's alpha and ICC values with 95% CI of each item for test-retest reliability

Item	Cronbach's alpha	ICC	95% CI
1	0.984	0.982	0.972-0.988
2	0.972	0.971	0.957-0.980
3	0.975	0.974	0.962-0.983
4	0.975	0.974	0.963-0.983
5	0.975	0.974	0.960-0.982
6	0.970	0.967	0.948-0.978
7	0.994	0.994	0.991-0.996

ICC: Intraclass correlation coefficient; CI: Confidence interval.

CPFQ showed a good positive correlation with HADS depression, while it showed a moderate positive correlation with the HADS anxiety and FIQ. A significant but weak negative correlation was detected between CPFQ and MMSE. While there was no significant correlation between MMSE and FM disease activity and HADS anxiety, there was a significant but weak negative correlation between MMSE and HADS depression. The correlations between the evaluation scales are shown in Table 4.

## DISCUSSION

Since physical and cognitive disorders can be present in FM and are among the diagnostic

criteria, it is important to evaluate physical and cognitive functions in this disease. However, there is no special scale developed in FM in a practical way to evaluate cognitive functions, and since the application of the scales used to evaluate the cognitive function is not very practical, it can be neglected in clinical practices to evaluate FM patients in terms of cognitive functions.<sup>20-22</sup> CPFQ is an easily implemented questionnaire that evaluates cognitive and physical functions, and it has shown validity and reliability. Therefore, we thought that this questionnaire may be effective in evaluating cognitive functions in FM patients. There is no other validity and reliability study except for the previously mentioned two studies.<sup>24,26</sup> The validity and reliability of the Turkish version should be shown to evaluate the compliance of the scales developed in foreign languages to Turkish society and to measure the applicability in Turkish society. In this study, we examined the validity and reliability of the Turkish version of CPFQ in FM patients in evaluating cognitive functions and found it easy to apply, reliable, and valid in FM patients.

Cronbach's alpha was evaluated in the assessment of internal consistency. Cronbach's alpha values were found to be 0.9 and 0.91 in the reliability and validity studies of CPFQ.<sup>24,26</sup> In our study, Cronbach's alpha value for CPFQ was 0.796. Cronbach's alpha values >0.6 show sufficient internal consistency.<sup>35</sup> ICC values were calculated to assess the test-retest reliability.

**Table 4.** Correlations between the evaluation scales and significance levels analyzed for construct validity

	CPFQ	FIQ	HADS anxiety	HADS depression
FIQ				
r	0.449**	1		
p	0.000			
HADS anxiety				
r	0.488**	0.454**	1	
p	0.000	0.000		
HADS depression				
r	0.542**	0.357**	0.710**	1
p	0.000	0.000	0.000	
MMSE				
r†	-0.202*	-0.051	-0.179	-0.193*
p	0.029	0.582	0.053	0.037

r: Spearman correlation coefficient; r†: Pearson correlation coefficient; \* Significance level p=0.05; \*\* Significance level p=0.001; CPFQ: Massachusetts General Hospital Cognitive and Physical Functioning Questionnaire; FIQ: Fibromyalgia impact questionnaire; HADS: Hospital Anxiety and Depression Scale; MMSE: Mini mental state examination.



In the original questionnaire development study, ICC was found to be 0.57, while in our study, we found it to be 0.78. In the original questionnaire development study, the ICC value of each item was over 0.6,<sup>24</sup> while in our study, we found ICC values over 0.9. These results showed that the CPFQ has test-retest reliability.

In the original questionnaire development study, to assess the sensitivity to the change in patients with depression and anxiety, the Hamilton Depression Rating Scale and Hamilton Anxiety Evaluation Scale were used, and a significant positive correlation was found between CPFQ and the Hamilton Depression Rating Scale.<sup>24</sup> As a result, CPFQ was found to be sensitive to treatment changes in anxiety and depression patients.<sup>24</sup> In a study in which different antidepressants were evaluated with CPFQ, a significant but weak correlation was found between CPFQ and the Hamilton Depression Rating Scale and Montgomery-Asberg Depression Rating Scale.<sup>26</sup> This has been interpreted as the questionnaire being sensitive to emotional changes instead of the cognitive aspect of depression. In the same study, it is emphasized that cognitive and physical symptoms can be evaluated with CPFQ independent of depression severity. In the same study, it was found that CPFQ was sensitive to the changes due to the treatment in depression patients.<sup>26</sup> Hamilton Depression Rating Scale, Hamilton Anxiety Evaluation Scale, and Montgomery-Asberg Depression Rating Scale are used to evaluate the severity of disease symptoms in patients diagnosed with depression or anxiety. The HADS anxiety and depression scale that we used in our study was not aimed at determining the severity of symptoms as it is a screening scale developed to predict the existence of the disease. In our study, since FM patients who were diagnosed with depression and anxiety were excluded from the study, HADS was used instead of scales evaluating the severity of depression symptoms and changes due to the treatment. To investigate the construct validity, correlation between CPFQ and HADS was evaluated. CPFQ showed a good positive correlation with HADS depression, while it showed a moderate positive correlation with HADS anxiety. These results show that CPFQ may be associated with physical and cognitive functions caused by the emotional condition in FM patients.

In the original questionnaire development study, the correlation of apathy and cognitive function with the neuropsychological measurement assessment was examined with Apathy Evaluation Scale (AES) and the Conners' continuous performance test (CCPT). AES and CPFQ were evaluated before and after treatment and were found to be correlated; CPFQ was as sensitive as AES to treatment change.<sup>24</sup> Baer et al.<sup>26</sup> found a moderate correlation between CPFQ and apathy. In our study, we did not use any scale that evaluates apathy since apathy is observed in clinical situations such as dementia, delirium, depression, and schizophrenia, and apathy is not one of the symptoms of FM; it can only be a side effect due to medications used in FM.<sup>8</sup> In the original questionnaire development study,<sup>24</sup> CCPT was used in cognitive evaluation, while MMSE was used in our study. Attention and impulses are evaluated with CCPT. CCPT is used in attention deficit and hyperactivity disorder (ADHD) and schizophrenia, in which attention deficit and impulse symptoms are at the forefront.<sup>36</sup> In a study, FM was more frequent in patients with ADHD compared to the control group.<sup>37</sup> In another study, it was shown that FM patients could have ADHD in both adulthood and childhood, and it was concluded that there may be a connection between FM and impulses.<sup>38</sup> Failure to evaluate impulse is one of the limitations of our study. However, distortion of cognitive functions, such as attention, memory, and concentration, are common in FM patients, and these functions can be evaluated with MMSE, while these functions cannot be evaluated with CCPT.<sup>11,12,36</sup>

In our study, the relationship between FIQ scores and CPFQ scores was examined. CPFQ showed a moderate positive correlation with FIQ. These results may indicate that the CPFQ may be successful in evaluating disease activity and cognitive functioning associated with depression and anxiety symptoms.

The MMSE is also widely used cognitive screening test, and its reliability and validity was demonstrated.<sup>30</sup> In addition, MMSE is used to evaluate cognitive functions in FM.<sup>23,39</sup> In our study, a significant but weak negative correlation was found between CPFQ and MMSE. While there was no significant correlation between MMSE and FM disease activity and HADS anxiety, there was a significant but weak negative correlation

between MMSE and HADS depression. These results may be due to the fact that MMSE is only evaluating objective cognitive function rather than physical functionality. In addition, due to the general structure of the questioned factors and the fact that MMSE is more difficult to apply, it can be concluded that CPFQ may be more effective than MMSE in the evaluation of cognitive loss due to depression and anxiety. As can be seen from the results of our study, there was a moderate correlation between FM disease activity and depression and anxiety. The application time of MMSE varies between 8 and 16 min and contains more difficult questions to understand and implement according to CPFQ.<sup>29</sup> The completion time of CPFQ was about 2 min. This shows that the Turkish version of CPFQ is a questionnaire that can be easily applied in a short time.

In the original questionnaire development study, the correlation between CPFQ, Brief Fatigue Inventory, and Epworth Sleepiness Scale was evaluated, and the sensitivity to change with treatment was examined. As a result, a significant correlation was found between these scales.<sup>24</sup> Baer et al.<sup>26</sup> found a moderate correlation between CPFQ and fatigue scales, which may be due to CPFQ evaluating subjective experience of physical functionality. In the same study, CPFQ was found to be correlated with the Fatigue Associated with Depression Questionnaire, which evaluates the effect of fatigue associated with depression on daily life and functionality. In our study, the fact that there is no evaluation with any scale that directly evaluates fatigue and insomnia is another limitation of our study, but there is a question that evaluates the severity of fatigue in FIQ, and FIQ contains the fatigue parameter.

A limitation of our study is that it was carried out in a single center. Depending on regional differences, there may be differences in terms of perception, understanding, and interpreting questions. Another limitation is neglecting to include a control group. The only exclusion criteria for the test-retest study were patients below 18 years of age, patients who had been diagnosed with cognitive disorders, patients with psychiatric diagnoses, and patients who had a change in the clinical situation and medication within the last week before the retest. It should be kept in mind that the medications used in the treatment may cause confusion, memory problems, and

cognitive impairments. Thus, a limitation of our study was that we did not evaluate how cognitive function was affected by the medications used in the treatment. Moreover, in further studies, response to treatment and the questionnaire's sensitivity to change should be studied. The low number of male patients is another limitation, but it was interpreted as an expected condition due to female dominance in FM. Our study was designed to include only FM patients. Therefore, CPFQ should be evaluated in other diseases, particularly neurological diseases, to generalize other groups of patients who may be impaired in physical and cognitive functions.

In conclusion, this study showed that the Turkish version of CPFQ is reliable and valid in FM patients. It is a scale that can be used in the evaluation and follow-up of patients who have been diagnosed with FM in Turkish society due to it being easy to apply and understandable and its ability to evaluate cognitive and physical functioning.

**Ethics Committee Approval:** The study protocol was approved by the Ondokuz Mayıs University Clinical Research Ethics Committee (date: 29.04.2021, no: 2021/227). The study was conducted in accordance with the principles of the Declaration of Helsinki.

**Patient Consent for Publication:** A written informed consent was obtained from each patient.

**Data Sharing Statement:** The data that support the findings of this study are available from the corresponding author upon reasonable request.

**Author Contributions:** Concept: M.A.K., M.I., I.I.; Design: M.A.K., M.I., I.I.; Data collection or processing: M.A.K., M.I.; Analysis or interpretation: M.I., I.I.; Literature search: M.A.K., M.I.; Writing: M.A.K., M.I., I.I.; Editing and supervisory: I.I.

**Conflict of Interest:** The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

**Funding:** The authors received no financial support for the research and/or authorship of this article.

## REFERENCES

1. Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C, Goldenberg DL, et al. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. Report of the multicenter criteria committee. *Arthritis Rheum* 1990;33:160-72. doi: 10.1002/art.1780330203.

2. Clauw DJ. Fibromyalgia: A clinical review. *JAMA* 2014;311:1547-55. doi: 10.1001/jama.2014.3266.
3. Queiroz LP. Worldwide epidemiology of fibromyalgia. *Curr Pain Headache Rep* 2013;17:356. doi: 10.1007/s11916-013-0356-5.
4. Bellato E, Marini E, Castoldi F, Barbasetti N, Mattei L, Bonasia DE, et al. Fibromyalgia syndrome: Etiology, pathogenesis, diagnosis, and treatment. *Pain Res Treat* 2012;2012:426130. doi: 10.1155/2012/426130.
5. Bradley LA. Pathophysiology of fibromyalgia. *Am J Med* 2009;122(12 Suppl):S22-30. doi: 10.1016/j.amjmed.2009.09.008.
6. Wolfe F, Clauw DJ, Fitzcharles MA, Goldenberg DL, Katz RS, Mease P, et al. The American College of Rheumatology preliminary diagnostic criteria for fibromyalgia and measurement of symptom severity. *Arthritis Care Res (Hoboken)* 2010;62:600-10. doi: 10.1002/acr.20140.
7. Yunus M, Masi AT, Calabro JJ, Miller KA, Feigenbaum SL. Primary fibromyalgia (fibrositis): Clinical study of 50 patients with matched normal controls. *Semin Arthritis Rheum* 1981;11:151-71. doi: 10.1016/0049-0172(81)90096-2.
8. Bennett RM. Clinical manifestations and diagnosis of fibromyalgia. *Rheum Dis Clin North Am* 2009;35:215-32. doi: 10.1016/j.rdc.2009.05.009.
9. Hawkins RA. Fibromyalgia: A clinical update. *J Am Osteopath Assoc* 2013;113:680-9. doi: 10.7556/jaoa.2013.034.
10. Martínez-Lavin M, López S, Medina M, Nava A. Use of the leeds assessment of neuropathic symptoms and signs questionnaire in patients with fibromyalgia. *Semin Arthritis Rheum* 2003;32:407-11. doi: 10.1053/sarh.2003.50017.
11. Bar-On Kalfon T, Gal G, Shorer R, Ablin JN. Cognitive functioning in fibromyalgia: The central role of effort. *J Psychosom Res* 2016;87:30-6. doi: 10.1016/j.jpsychores.2016.06.004.
12. Glass J. Cognitive dysfunction in fibromyalgia syndrome. *J Musculoskelet Pain* 2010;18:367-72. doi: 10.3109/10582452.2010.502626.
13. Kravitz HM, Katz RS. Fibrofog and fibromyalgia: A narrative review and implications for clinical practice. *Rheumatol Int* 2015;35:1115-25. doi: 10.1007/s00296-014-3208-7.
14. Pericot-Nierga I, Hernández-Ferrándiz M, Lozano-Gallego M, Vilalta-Franch J, Cruz-Reina M del M, López-Pousa S. Cognitive profile in fibromyalgia. Comparison with a mild cognitive impairment group. *Med Clin (Barc)* 2009;133:91-4. doi: 10.1016/j.medcli.2008.10.051.
15. Katz RS, Heard AR, Mills M, Leavitt F. The prevalence and clinical impact of reported cognitive difficulties (fibrofog) in patients with rheumatic disease with and without fibromyalgia. *J Clin Rheumatol* 2004;10:53-8. doi: 10.1097/01.rhu.0000120895.20623.9f.
16. Harker KT, Klein RM, Dick B, Verrier MJ, Rashiq S. Exploring attentional disruption in fibromyalgia using the attentional blink. *Psychol Health* 2011;26:915-29. doi: 10.1080/08870446.2010.525639.
17. Grace GM, Nielson WR, Hopkins M, Berg MA. Concentration and memory deficits in patients with fibromyalgia syndrome. *J Clin Exp Neuropsychol* 1999;21:477-87. doi: 10.1076/jcen.21.4.477.876.
18. Glass JM. Review of cognitive dysfunction in fibromyalgia: A convergence on working memory and attentional control impairments. *Rheum Dis Clin North Am* 2009;35:299-311. doi: 10.1016/j.rdc.2009.06.002.
19. Bilgici A, Terzi M, Güz H, Kuru Ö. Comparison of the cognitive performance between healthy controls, rheumatoid arthritis and fibromyalgia patients without depression. *J Clin Anal Med* 2014;5:216-21.
20. Park DC, Glass JM, Minear M, Crofford LJ. Cognitive function in fibromyalgia patients. *Arthritis Rheum* 2001;44:2125-33. doi: 10.1002/1529-0131(200109)44:9<2125::AID-ART365>3.0.CO;2-1.
21. Epstein SA, Kay G, Clauw D, Heaton R, Klein D, Krupp L, et al. Psychiatric disorders in patients with fibromyalgia. A multicenter investigation. *Psychosomatics* 1999;40:57-63. doi: 10.1016/S0033-3182(99)71272-7.
22. Nishioka K, Hayashi T, Suzuki M, Li Y, Nakayama S, Matsushima T, et al. Fibromyalgia syndrome and cognitive dysfunction in elderly: A case series. *Int J Rheum Dis* 2016;19:21-9. doi: 10.1111/1756-185X.12734.
23. Rodríguez-Andreu J, Ibáñez-Bosch R, Portero-Vázquez A, Masramon X, Rejas J, Gálvez R. Cognitive impairment in patients with fibromyalgia syndrome as assessed by the mini-mental state examination. *BMC Musculoskelet Disord* 2009;10:162. doi: 10.1186/1471-2474-10-162.
24. Fava M, Iosifescu DV, Pedrelli P, Baer L. Reliability and validity of the Massachusetts general hospital cognitive and physical functioning questionnaire. *Psychother Psychosom* 2009;78:91-7. doi: 10.1159/000201934.
25. Nunnally JC. *Psychometric theory*. 2nd ed. New York: McGraw Hill; 1978.
26. Baer L, Ball S, Sparks J, Raskin J, Dubé S, Ferguson M, et al. Further evidence for the reliability and validity of the Massachusetts General Hospital Cognitive and Physical Functioning Questionnaire (CPFQ). *Ann Clin Psychiatry* 2014;26:270-80.
27. Bennett R. The Fibromyalgia Impact Questionnaire (FIQ): A review of its development, current version, operating characteristics and uses. *Clin Exp Rheumatol* 2005;23(5 Suppl 39):S154-62.
28. Sarmer S, Ergin S, Yavuzer G. The validity and reliability of the Turkish version of the Fibromyalgia Impact Questionnaire. *Rheumatol Int* 2000;20:9-12. doi: 10.1007/s002960000077.
29. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician.



- J Psychiatr Res 1975;12:189-98. doi: 10.1016/0022-3956(75)90026-6.
30. Güngen C, Ertan T, Eker E, Yağar R, Engin F. Standardize Mini Mental Test'in Türk toplumunda hafif demans tanısında geçerlik ve güvenilirliği. Turk Psikiyatri Derg 2002;13:273-81.
  31. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand 1983;67:361-70. doi: 10.1111/j.1600-0447.1983.tb09716.x.
  32. Aydemir Ö. Hastane Anksiyete ve Depresyon Ölçeği Türkçe formunun geçerlilik ve güvenilirliği. Turk Psikiyatri Derg 1997;8:280-7.
  33. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine (Phila Pa 1976) 2000;25:3186-91. doi: 10.1097/00007632-200012150-00014.
  34. Koldas Dogan S, Ay S, Evcik D, Baser O. Adaptation of Turkish version of the questionnaire Quick Disability of the Arm, Shoulder, and Hand (Quick DASH) in patients with carpal tunnel syndrome. Clin Rheumatol 2011;30:185-91. doi: 10.1007/s10067-010-1470-y.
  35. Thanasegaran G. Reliability and validity issues in research. Integration & Dissemination 2009;4:35-40.
  36. Shaked D, Faulkner LMD, Tolle K, Wendell CR, Waldstein SR, Spencer RJ. Reliability and validity of the Conners' Continuous Performance Test. Appl Neuropsychol Adult 2020;27:478-87. doi: 10.1080/23279095.2019.1570199.
  37. Golimstok A, Fernández MC, Garcia Basalo MM, Garcia Basalo MJ, Campora N, Berrios W, et al. Adult attention-deficit and hyperactivity disorder and fibromyalgia: A case-control study. Neuro Open J 2015;2:61-6. doi: 10.17140/NOJ-2-114.
  38. Yılmaz E, Tamam L. Attention-deficit hyperactivity disorder and impulsivity in female patients with fibromyalgia. Neuropsychiatr Dis Treat 2018;14:1883-9. doi: 10.2147/NDT.S159312.
  39. Can SS, Gencay-Can A, Gunendi Z. Validity and reliability of the clock drawing test as a screening tool for cognitive impairment in patients with fibromyalgia. Compr Psychiatry 2012;53:81-6. doi: 10.1016/j.comppsy.2011.02.001.