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Psychometric properties of the Turkish version of the "Functional Assessment of Chronic Illness Therapy-Fatigue Scale" in patients with chronic obstructive pulmonary disease

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Abstract:

BACKGROUND AND AIM: Chronic obstructive pulmonary disease (COPD) is frequently associated with fatigue, which negatively affects quality of life. The Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-F) scale is widely used to assess fatigue; however, its psychometric properties have not yet been established in Turkish patients with COPD. This study aimed to evaluate the reliability and preliminary construct validity of the Turkish version of the FACIT-F scale in patients with COPD.

METHODS: A total of 135 patients with a confirmed diagnosis of COPD (mean age 66.55±9.11 years) participated in the study. Internal consistency was assessed using Cronbach's alpha, and test–retest reliability was evaluated using the intraclass correlation coefficient (ICC). Exploratory factor analysis (EFA) was conducted to examine the factorial structure of the scale. Construct validity was assessed through correlation analyses with related clinical and functional measures. Known-group comparisons were performed according to disease severity.

RESULTS: Cronbach's alpha for the Turkish FACIT-F scale was α=0.945, and the ICC was 0.954. The scale showed strong correlations with the Piper Fatigue Scale (r=-0.725 to -0.820) and the COPD and Asthma Fatigue Scale (r=-0.760). Moderate correlations were observed with the modified Medical Research Council dyspnea scale (r=-0.489), the COPD Assessment Test (r=-0.588), the Center for Epidemiologic Studies Depression Scale (r=-0.501), and St. George's Respiratory Questionnaire scores (r=-0.437 to -0.652). Factor analysis confirmed a one-factor structure, with factor loadings ranging from 0.605 to 0.879.

CONCLUSIONS: The Turkish version of the FACIT-F scale is a reliable and psychometrically sound instrument for assessing fatigue in patients with COPD. Its use in clinical and rehabilitation settings may facilitate systematic evaluation of fatigue severity and support individualized patient management.

Keywords:

Chronic obstructive pulmonary disease, fatigue, psychometric properties, reliability, quality of life, validity

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Introduction

Chronic obstructive pulmonary disease (COPD) is characterized by persistent and progressively worsening airflow limitation resulting from an abnormal inflammatory response of the lungs to noxious particles or gases.[1] Recognized as a major public health concern worldwide, COPD affects approximately 12.64% of individuals over the age of 40 based on fixed-ratio diagnostic criteria.[2] The disease typically develops from chronic airway inflammation, commonly manifesting as chronic bronchitis, along with alveolar destruction known as emphysema.[1,2] Patients with COPD frequently present with respiratory symptoms such as dyspnea, chronic cough, and increased sputum production, as well as extrapulmonary manifestations including fatigue, musculoskeletal pain, psychological distress, and reduced muscle strength.[3,4] The coexistence of these symptoms substantially impairs physical functioning and perceived health status.[5]

Fatigue is defined as a persistent and overwhelming sense of tiredness or lack of energy that is disproportionate to physical activity and not relieved by rest.[6] In patients with COPD, fatigue is recognized as the second most common and burdensome symptom after dyspnea. Epidemiological studies report that the prevalence of fatigue in this patient group varies considerably, ranging from 17% to 95%.[7] This symptom exerts a substantial negative impact on patients' physical capacity, activity participation, and overall quality of life, often resulting in increased reliance on others.[7–9] Furthermore, fatigue has been associated with poorer clinical outcomes, including a heightened risk of acute exacerbations and increased mortality rates in patients with chronic respiratory conditions.[10]

Considering the rising awareness of fatigue as a critical symptom in patients with COPD, the development and application of concise, feasible, and psychometrically robust measurement tools for assessing fatigue in this population have become increasingly important.[11]

A wide range of instruments has been used to assess fatigue in patients with COPD, including unidimensional, multidimensional, and disease-specific scales.[12] These instruments include the Brief Fatigue Inventory,[13] the Identity–Consequence Fatigue Scale,[14] the Fatigue Impact Scale,[15] the Multidimensional Fatigue Inventory,[16] the Checklist Individual Strength,[17] the Fatigue Severity Scale,[18] the Piper Fatigue Scale,[19] the Manchester COPD Fatigue Scale,[20] and the COPD and Asthma Fatigue Scale.[21] Among these, the Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-F) scale is one of the most frequently used measures.[11]

The psychometric properties of patient-reported outcome measures cannot be assumed to be universally stable across different cultural, linguistic, and clinical contexts. Cultural norms, language structure, health beliefs, and symptom expression can substantially influence how individuals perceive, interpret, and report subjective experiences such as fatigue.[22,23] Therefore, even when an instrument has demonstrated strong psychometric performance in its original language or in other populations, re-evaluation within a new cultural context is essential to ensure measurement accuracy, conceptual equivalence, and clinical interpretability.[24]

In addition to cultural considerations, disease-specific characteristics further justify renewed psychometric evaluation. The FACIT-F scale was originally developed for oncology populations, in which fatigue is often driven by mechanisms such as cancer-related anemia, systemic inflammation, and treatment-related side effects.[25,26] In contrast, fatigue in COPD arises from distinct and multifactorial mechanisms, including persistent dyspnea, sleep disturbances, reduced physical activity, skeletal muscle dysfunction, and chronic systemic inflammation.[27,28] These differences may influence both the severity and functional impact of fatigue, underscoring the importance of examining whether the FACIT-F scale retains its structural validity and measurement properties in patients with COPD.[29]

The 13-item FACIT-F scale is a widely used instrument designed to assess multiple dimensions of fatigue in patients with chronic illnesses.[11,12] Although it has been frequently applied in populations with COPD, the psychometric properties of its Turkish adaptation have not yet been evaluated. Accordingly, this study aimed to assess the psychometric properties, specifically the reliability and preliminary construct validity, of the Turkish version of the FACIT-F scale in a population with COPD. It was hypothesized that the Turkish version would demonstrate high internal consistency, strong test–retest reliability, and construct validity consistent with findings reported in other patient populations.

Materials and Methods

Research design and ethical considerations

This methodological cross-sectional study was conducted between April 2023 and October 2024 at the Department of Chest Diseases, İzmir Katip Çelebi University Faculty of Medicine, İzmir, Türkiye. The Turkish version of the Functional Assessment of Chronic Illness Therapy-Fatigue (FACIT-F) scale was obtained from the official FACIT.org website, and formal permission for its use in psychometric evaluation was granted. Ethical approval for the study protocol was obtained from the İzmir Katip Çelebi University Non-invasive Clinical Research Ethics Committee (Approval Number: 0383, Date: 22.09.2022). All study procedures were conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to data collection.

Participants and procedure

Individuals aged 40 years and older with a confirmed clinical diagnosis of COPD, verified by a respiratory specialist in accordance with the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria,[1] were included in the study. Participants were required to be clinically stable for at least three months and fluent in Turkish. Exclusion criteria included the presence of coexisting systemic, cardiovascular, neurological, or musculoskeletal conditions; other pulmonary diseases; or cognitive impairments that could interfere with comprehension or task completion.[11]

Demographic and clinical characteristics, including age, sex, educational level, employment status, body mass index, disease duration, and pulmonary function test results, were recorded. To assess test–retest reliability, the FACIT-F scale was re-administered one week after the initial assessment.

Outcome measures

In this study, a standardized methodology for scale validation was applied in accordance with established guidelines.[24] Sociodemographic data (age, sex, educational level, and employment status) and clinical information (body mass index, disease duration, and pulmonary function test results) were collected. To evaluate construct validity, participants completed the Turkish versions of several validated instruments in addition to the FACIT-F scale.[11] These instruments included the Piper Fatigue Scale,[30] the COPD and Asthma Fatigue Scale,[31] the modified Medical Research Council (mMRC) Dyspnea Scale,[32] the COPD Assessment Test (CAT),[33] the St. George's Respiratory Questionnaire (SGRQ),[34] and the Center for Epidemiologic Studies Depression Scale (CES-D).[35] Test-retest reliability of the FACIT-F scale was assessed by re-administering the instrument to participants one week after the initial evaluation. All data collection procedures were performed by an experienced and qualified physiotherapist.

FACIT-F Scale: The FACIT-F is a 13-item self-administered questionnaire developed to assess multiple dimensions of fatigue. It was originally designed for use in patients with cancer-related anemia.[36] The scale evaluates both the intensity of fatigue (items 1–4 and 7) and its impact on daily functioning (items 5–6 and 8–13). Each item is scored on a five-point Likert scale ranging from 0 to 4, yielding a total score between 0 and 52, with higher scores indicating lower fatigue severity.[11]

Piper Fatigue Scale: This 22-item instrument assesses the subjective experience of fatigue across four domains: behavioral/severity, affective meaning, sensory perception, and cognitive/mood status.[30] Each item is rated on a 0–10 scale. The total score is calculated by averaging item responses, with higher mean scores indicating greater perceived fatigue.

COPD and Asthma Fatigue Scale: This fatigue-specific instrument consists of 12 items and was developed to assess fatigue levels in patients with COPD and asthma.[31] Items are rated on a five-point Likert scale. The total raw score ranges from 12 to 60 and is converted to a standardized 0–100 scale using a predefined formula, with higher scores indicating greater fatigue severity.

mMRC Dyspnea Scale: The modified Medical Research Council (mMRC) Dyspnea Scale is a brief, five-point measure used to assess the degree of breathlessness experienced during daily physical activities. Patients rate their dyspnea from 0 (no breathlessness) to 4 (very severe dyspnea), based on the level of exertion required to provoke symptoms. This scale is used as a practical indicator of functional respiratory impairment.[32]

COPD Assessment Test: The CAT is an eight-item questionnaire designed to assess the health status of patients with COPD.[33] It captures symptoms such as dyspnea,

cough, and sputum production, as well as broader health concerns including sleep quality and fatigue. Each item is scored from 0 to 5, yielding a total score between 0 and 40, with higher scores indicating more severe symptoms and poorer quality of life.

St. George's Respiratory Questionnaire: The SGRQ is a disease-specific instrument developed to evaluate health-related quality of life in patients with chronic respiratory diseases.[34] It consists of 50 items across three domains: respiratory symptoms, activity limitations, and the overall impact of the disease. Each domain is scored separately, and a total score ranging from 0 (no impairment) to 100 (maximum impairment) is calculated.

CES-Depression Scale: The CES-D is a 20-item instrument designed to assess the frequency and severity of depressive symptoms in the general population. Respondents indicate how often they experienced each symptom during the preceding week using a four-point Likert scale (0–3). Total scores range from 0 to 60, with higher scores reflecting greater depressive symptom burden. In most research settings, a score of 16 or higher is considered indicative of clinically relevant depressive symptomatology.[35]

Statistical analysis

There is no universally accepted consensus regarding the minimum sample size required for validation studies; however, a commonly cited recommendation is to include 2–20 participants per item.[37,38] Given that the FACIT-F scale comprises 13 items, the inclusion of 135 participants exceeded these recommendations and was considered sufficient for reliability analyses and exploratory factor analysis. However, this sample size may be considered borderline for more advanced psychometric procedures, such as confirmatory factor analysis or subgroup-based validity testing.

All statistical analyses were performed using IBM SPSS Statistics for Windows, version 22.0 (IBM Corp., Armonk, NY, USA). The normality of continuous variables was assessed using the Kolmogorov–Smirnov test in conjunction with visual inspection of histograms. Descriptive statistics were presented as means and standard deviations for variables with a normal distribution, and as medians with interquartile ranges (25^{th}–75^{th} percentiles) for variables that did not meet normality assumptions. Categorical variables were summarized as frequencies and percentages.

Internal consistency of the FACIT-F scale was evaluated using Cronbach's alpha coefficient, with values greater than 0.70 considered indicative of acceptable reliability.[39] Intra-rater reliability for both total scale scores and individual items was assessed using the intraclass correlation coefficient (ICC) based on a two-way random-effects model with absolute agreement. ICC values greater than 0.90 were interpreted as indicating excellent reliability.[40]

To explore the factorial structure of the scale, exploratory factor analysis (EFA) was conducted to evaluate the underlying dimensional structure of the FACIT-F scale. A minimum explained variance threshold of 60% was considered supportive of a unidimensional structure. Prior to EFA, the suitability of the data for factor analysis was assessed.

Concurrent validity was examined using Pearson or Spearman correlation coefficients, depending on the distributional characteristics of the variables. Ninety-five percent confidence intervals (CIs) were calculated for all relevant estimates. To assess convergent validity, it was hypothesized that FACIT-F scores would demonstrate moderate to strong correlations with other fatigue-related instruments, disease severity indices, dyspnea scales, depression measures, and quality-of-life assessments.

The interpretation of correlation magnitude followed established thresholds: negligible ($|r| \leq 0.10$), weak ($|r| = 0.10$–0.39), moderate ($|r| = 0.40$–0.69), strong ($|r| = 0.70$–0.89), and very strong ($|r| \geq 0.90$).

Known-group validity was assessed according to disease severity based on the GOLD stage using the independent samples t test. A p-value <0.05 was considered statistically significant.

Results

A total of 155 patients with a confirmed diagnosis of COPD were screened for participation. After applying the inclusion and exclusion criteria, 20 individuals were excluded, resulting in a final sample of 135 participants. Demographic and clinical characteristics of the cohort are summarized in Table 1. The sample was predominantly male (81.5%), with a mean age of 65.55 years and a mean body mass index (BMI) of 24.77 kg/m². Most participants had completed primary education (52.6%) and were retired (59.3%). Regarding disease severity, the

Table 1: Characteristics of the patients

Variables (n=135)	Mean±SD or Median (IQR)
Age, years	65.55 ± 9.11
Body mass index, kg/m^2	24.77 ± 5.06
Disease duration (years)	10.66 ± 7.88
Pulmonary function test	
FEV$_1$, %	55.18 ± 7.46
FVC, %	60.50 ± 7.8
FEV$_1$/FVC	52.7 ± 11.37
mMRC, points	2.4 ± 1.34
CAT score, 0-40	22.61 ± 9.86
St. George's respiratory questionnaire	
Symptoms, 0–100	48.12 ± 20.39
Activity, 0–100	67.48 ± 22.10
Impact, 0–100	37.14 ± 21.78
Total score, 0–100	56.88 ± 21.33
Emergency department visits (last year)	0 (0/2)
Hospitalizations (last year)	0 (0/1)
Smoking history (pack-years)	47.75 ± 21.46
FACIT-F, 0–52	33.99 ± 17.22
Piper fatigue scale	
Behavioral, 0–10	4.32 ± 2.71
Affective, 0–10	4.30 ± 2.49
Sensory, 0–10	4.17 ± 1.62
Cognitive, 0–10	4.14 ± 1.91
Total score, 0–10	4.30 ± 2.22
COPD and asthma fatigue scale	58.84 ± 26.51
CES-D Depression Scale, 0–60	21.77 ± 10.04
	n (%)
Male sex	110 (81.5)
COPD stage	
Stage 1	5 (3.7)
Stage 2	50 (37.0)
Stage 3	55 (40.7)
Stage 4	25 (18.5)
Smoking status	
Current smoker	31 (22.9)
Ex-smoker	88 (65.2)
Never smoked	16 (11.9)
Education level	
Primary School	71 (52.6)
High School	46 (34.1)
University	18 (13.3)
Employment status	
Working	34 (25.2)
Not working	21 (15.5)
Retired	80 (59.3)

Data presented as mean±standard deviation, median (25th-75th interquartile range), or percentage (%) SD: Standard deviation, IQR: Interquartile range, FEV$_1$: Forced expiratory volume in one second, FVC: Forced vital capacity, mMRC dyspnea scale: Modified Medical Research Council Dyspnea Scale, CAT: COPD assessment test, COPD: Chronic obstructive pulmonary disease

majority were classified as GOLD stage 3 (40.7%) or stage 2 (37.0%), with a mean disease duration of 10.66 years.

Test–retest reliability analysis demonstrated excellent temporal stability, with an intraclass correlation coefficient of 0.954 for the total FACIT-F score and item-specific ICC values ranging from 0.807 to 0.966 (Table 2). Internal consistency was also high, as indicated by Cronbach's alpha coefficient of 0.945. Item-deletion analysis showed minimal variation, with alpha values remaining between 0.935 and 0.944, supporting the retention of all items in the scale. Exploratory factor analysis supported a unidimensional structure of the FACIT-F scale. Factor loadings ranged from 0.605 to 0.879, indicating strong item–factor associations. The single-factor structure explained 52.4% of the total variance (Table 2).

Construct validity analyses are presented in Table 3. No significant correlations were observed between the total FACIT-F score and variables such as age, BMI, or disease duration ($p>0.05$). However, weak correlations were identified with percent predicted forced expiratory volume in one second (%FEV$_1$) ($r=0.385$, $p=0.001$), frequency of emergency department visits in the previous year ($r=-0.350$, $p<0.001$), and number of hospitalizations ($r=-0.308$, $p=0.001$). Moderate inverse correlations were observed between the FACIT-F score and both the mMRC dyspnea scale ($r=-0.489$, $p<0.001$) and the CAT score ($r=-0.588$, $p<0.001$), supporting convergent validity.

Strong negative correlations were found between the FACIT-F score and both the total and subscale scores of the Piper Fatigue Scale (ranging from -0.725 to -0.820, $p<0.001$), as well as with the COPD and Asthma Fatigue Scale ($r=-0.760$, $p<0.001$). Additionally, moderate correlations were observed with the CES-D Scale ($r=-0.501$, $p<0.001$) and with SGRQ domain scores ($r=-0.437$ to -0.652, $p<0.001$). Known-group validity analysis demonstrated that FACIT-F scores were significantly lower in patients classified as GOLD stages 3 and 4 (Table 4).

Discussion

The present study evaluated the psychometric properties of the Turkish adaptation of the FACIT-F scale in patients with COPD. The findings indicate that the Turkish version of the FACIT-F demonstrates excellent internal consistency, high test–retest reliability, and a well-supported unidimensional factor structure. Col-

Table 2: Intra-rater reliability, Cronbach's α values if item deleted, and factor loadings for each item of the FACIT-F scale

	Intra-rater reliability [ICC (95% CI)]	Internal consistency (Cronbach α if item deleted)	Factor loading
Item 1	0.924 (0.872–0.954)	0.936	0.820
Item 2	0.950 (0.882–0.958)	0.935	0.831
Item 3	0.966 (0.928–0.976)	0.936	0.821
Item 4	0.942 (0.880–0.957)	0.940	0.771
Item 5	0.946 (0.826–0.951)	0.935	0.830
Item 6	0.954 (0.918–0.974)	0.935	0.879
Item 7	0.847 (0.661–0.901)	0.940	0.767
Item 8	0.913 (0.814–0.944)	0.940	0.761
Item 9	0.907 (0.765–0.948)	0.944	0.605
Item 10	0.809 (0.741–0.935)	0.942	0.657
Item 11	0.931 (0.839–0.950)	0.941	0.701
Item 12	0.823 (0.641–0.905)	0.940	0.784
Item 13	0.807 (0.670–0.911)	0.939	0.740
Total score	0.954 (0.687–0.965)	0.936	0.835

FACIT-F: Functional Assessment of Chronic Illness Therapy-Fatigue, ICC: Intraclass correlation coefficient, CI: Confidence interval

Table 3: Construct validity analysis of the Turkish version of the FACIT-F scale

Variables	FACIT-fatigue	
	r	p
Age	-0.033	0.774
Body mass index	0.006	0.901
Disease duration	0.005	0.964
Number of emergency department visits	-0.350	**<0.001**
Number of hospitalizations	-0.308	**0.001**
FEV_1%	0.385	**0.001**
mMRC	-0.489	**<0.001**
CAT score	-0.588	**<0.001**
Piper fatigue scale		
Behavioral	-0.788	**<0.001**
Affective	-0.807	**<0.001**
Sensory	-0.766	**<0.001**
Cognitive	-0.725	**<0.001**
Total score	-0.820	**<0.001**
COPD and asthma fatigue scale	-0.760	**<0.001**
CES-D depression scale score	-0.501	**<0.001**
St. George's respiratory questionnaire		
Symptoms	-0.561	**<0.001**
Activity	-0.437	**<0.001**
Impact	-0.652	**<0.001**
Total score	-0.611	**<0.001**

r represents Pearson's or Spearman's correlation coefficient. Bold values indicate statistically significant correlations. FACIT-F: Functional Assessment of Chronic Illness Therapy-Fatigue, FEV_1: Forced expiratory volume in one second, mMRC dyspnea scale: Modified medical research council dyspnea scale, CAT: COPD assessment test

Table 4: Group comparisons for known-group validity

Variables (n=135)	Stage 1–2	Stage 3–4	p*
FACIT-F (0–52)	38.16±16.41	31.23±18.54	<0.001

Data are presented as mean±standard deviation. *: Independent samples t-test. FACIT-F: Functional Assessment of Chronic Illness Therapy-Fatigue

lectively, these findings provide preliminary evidence supporting the construct validity and strong reliability of the Turkish version of the FACIT-F scale for assessing fatigue in patients with COPD.

Fatigue perception is influenced by cultural, social, and contextual factors, which may affect how individuals interpret and respond to patient-reported outcome measures.[22,41] Accordingly, even well-established fatigue instruments may exhibit variations in factor structure or item functioning across different cultural settings.[24] In this context, the unidimensional structure and strong psychometric performance of the Turkish version of the FACIT-F scale suggest that it captures a coherent fatigue construct within the cultural framework of Turkish patients with COPD.[29,42] Originally developed for oncology populations,[25] the FACIT-F scale has since been widely applied across multiple chronic conditions, including neurological, rheumatologic, and hematologic disorders.[43–45] The psychometric findings of the present study are consistent with previous validation studies in these populations, further supporting the robustness of the FACIT-F framework across diverse cultural and clinical contexts. In particular, the test–retest reliability coefficient (ICC=0.95) closely aligns with values reported in prior research, ranging from 0.90 to 0.95,[11,46,47] supporting the scale's temporal stability. It should also be noted that a substantial proportion of the study sample had a low level of education, which could potentially influence patients' comprehension of self-reported questionnaires. To mitigate this potential limitation, all assessments

were administered via face-to-face interviews by trained physiotherapists, ensuring standardized explanations of items without altering their original meaning.

The strong negative correlations observed between the Turkish FACIT-F and other fatigue measures—including the Piper Fatigue Scale and the COPD and Asthma Fatigue Scale—further support the scale's convergent validity. Moderate correlations with the mMRC Dyspnea Scale and the CAT were also consistent with prior findings in COPD cohorts.[7,48] These results highlight that, although fatigue overlaps with dyspnea and overall disease burden, it remains a distinct and multidimensional construct encompassing both physical and emotional components. The moderate association observed between fatigue and depressive symptoms, as measured by the CES-D, is also in line with growing evidence demonstrating the close relationship between psychological distress and fatigue severity in COPD.[7]

Interestingly, the present findings support emerging evidence suggesting that general disease impact measures, such as the CAT, may partially capture fatigue-related aspects of COPD.[49] However, the FACIT-F scale provides a more comprehensive and condition-relevant assessment of fatigue and its impact on daily functioning and overall well-being. The unidimensional factor structure identified in this study further supports the conceptualization of fatigue in COPD as a single underlying construct influenced by multiple interrelated factors, including dyspnea, sleep disturbances, and psychological strain.

The lack of association between fatigue and demographic variables such as age or body mass index is also consistent with findings from previous systematic reviews.[7] This suggests that fatigue severity is driven primarily by disease-related and psychosocial mechanisms rather than by general demographic or anthropometric characteristics. Consequently, incorporating fatigue assessment into comprehensive COPD management may enable clinicians to better address symptom clusters that affect daily functioning and quality of life. Correlations with demographic and clinical variables should be interpreted cautiously and are presented for exploratory purposes rather than as definitive evidence of construct validity.

From a clinical perspective, the Turkish adaptation of the FACIT-F scale represents an important addition to the assessment tools available to Turkish-speaking healthcare providers. Its brevity, strong psychometric properties, and disease relevance make it suitable for use in both research and clinical settings, facilitating early identification of fatigue-related limitations and supporting personalized rehabilitation strategies. Furthermore, the cultural and linguistic adaptation enhances accessibility and measurement accuracy, ensuring that contextual nuances are appropriately reflected in patient self-reports.

Limitations and directions for future research

Several limitations of this study should be acknowledged. Although exploratory factor analysis supported a unidimensional structure, confirmatory factor analysis could not be conducted because of sample size constraints and should be addressed in future research. First, the cross-sectional design limits the ability to draw causal inferences regarding the relationships between fatigue and other clinical variables. Second, the absence of objective measures of physical performance, such as the six-minute walk test or actigraphy, restricts the ability to link subjective fatigue assessment with physiological indicators. Third, data were collected from a single tertiary care center, and the demographic characteristics of the sample may not fully represent the broader COPD population in Türkiye, potentially limiting external validity and generalizability of the findings. In addition, a substantial proportion of participants had a low level of education, which may have influenced comprehension of self-reported questionnaires. This potential limitation was mitigated by administering all assessments through face-to-face interviews conducted by trained physiotherapists, ensuring standardized explanations without altering the original meaning of the items.

Moreover, the study sample was predominantly male, which may further limit generalizability given known sex-related differences in fatigue perception among patients with COPD. Most participants were classified as GOLD stage II–III; therefore, the psychometric properties of the FACIT-F scale may differ in patients with milder or more advanced disease stages. Additionally, medication use was not systematically recorded or controlled for, although pharmacological treatments may influence fatigue severity and other related outcomes.

Although depressive symptoms were evaluated, other psychosocial factors, such as anxiety, social support, or sleep quality, were not assessed and should be explored in future studies. Finally, longitudinal research with

larger and more heterogeneous samples is needed to evaluate the responsiveness of the FACIT-F scale to rehabilitation or pharmacological interventions and to support more comprehensive psychometric validation.

Conclusion

Despite these limitations, the use of a culturally adapted fatigue assessment tool may facilitate more individualized rehabilitation planning and enhance symptom-focused management in clinical COPD practice.

In summary, the Turkish version of the FACIT-F scale demonstrates strong reliability and preliminary evidence of construct validity for assessing fatigue in patients with COPD. These findings provide clinicians and researchers with a culturally appropriate and psychometrically sound instrument for evaluating the multifaceted impact of fatigue in Turkish populations. Broader use of this scale may improve clinical monitoring, support individualized rehabilitation strategies, and contribute to more comprehensive symptom management in chronic respiratory care.

Ethics Committee Approval

The study was approved by the İzmir Katip Çelebi University Non-invasive Clinical Research Ethics Committee (No: 0383, Date: 22/09/2022).

Informed Consent

Written informed consent was obtained from all participants prior to data collection.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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Author Contributions

Concept – N.S., İ.N.; Design – N.S., İ.N. Supervision – B.T., E.F., M.O.T. Resource – B.T., E.F., M.K., İ.N.; Materials – N.S.; Data Collection and/or Processing – N.S.; Analysis and/or Interpretation – N.S., B.T., İ.N.; Literature Review – B.T., E.F., M.K., İ.N., M.O.T.; Writing – N.S., B.T., İ.N.; Critical Review – M.K., E.F., M.O.T., İ.N.

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References

1. Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global strategy for the diagnosis, management, and prevention of COPD. 2019. https://goldcopd.org/wp-content/uploads/2018/11/GOLD-2019-v1.7-FINAL-14Nov2018-WMS.pdf Accessed Apr 7, 2025.
2. Al Wachami N, Guennouni M, Iderdar Y, Boumendil K, Arraji M, Mourajid Y, et al. Estimating the global prevalence of chronic obstructive pulmonary disease (COPD): a systematic review and meta-analysis. BMC Public Health 2024;24(1):297. [CrossRef]
3. Antoniu SA, Apostol A, Boiculese LV. Extra-respiratory symptoms in patients hospitalized for a COPD exacerbation: Prevalence, clinical burden and their impact on functional status. Clin Respir J 2019;13(12):735–40. [CrossRef]
4. Barnes PJ, Celli BR. Systemic manifestations and comorbidities of COPD. Eur Respir J 2009;33(5):1165–85. [CrossRef]
5. Park SK, Larson JL. Multiple symptoms, functioning, and general health perception in people with severe COPD over time. Appl Nurs Res 2016;29:76–82. [CrossRef]
6. Billones R, Liwang JK, Butler K, Graves L, Saligan LN. Dissecting the fatigue experience: A scoping review of fatigue definitions, dimensions, and measures in non-oncologic medical conditions. Brain Behav Immun Health 2021;15:100266. [CrossRef]
7. Ebadi Z, Goërtz YMJ, Van Herck M, Janssen DJA, Spruit MA, Burtin C, et al. The prevalence and related factors of fatigue in patients with COPD: a systematic review. Eur Respir Rev 2021;30(160):200298. [CrossRef]
8. Goërtz YMJ, Spruit MA, Van 't Hul AJ, Peters JB, Van Herck M, Nakken N, et al. Fatigue is highly prevalent in patients with COPD and correlates poorly with the degree of airflow limitation. Ther Adv Respir Dis 2019;13:1753466619878128. [CrossRef]
9. Kentson M, Tödt K, Skargren E, Jakobsson P, Ernerudh J, Unosson M, et al. Factors associated with experience of fatigue, and functional limitations due to fatigue in patients with stable COPD. Ther Adv Respir Dis 2016;10(5):410–24. [CrossRef]
10. Stridsman C, Lindberg A, Skär L. Fatigue in chronic obstructive pulmonary disease: a qualitative study of people's experiences. Scand J Caring Sci 2014;28(1):130–8. [CrossRef]
11. Al-shair K, Muellerova H, Yorke J, Rennard SI, Wouters EF, Hanania NA, et al.; ECLIPSE investigators. Examining fatigue in COPD: development, validity and reliability of a modified version of FACIT-F scale. Health Qual Life Outcomes 2012;10:100. [CrossRef]
12. Antoniu SA, Ungureanu D. Measuring fatigue as a symptom in COPD: from descriptors and questionnaires to the importance of the problem. Chron Respir Dis 2015;12(3):179–88. [CrossRef]
13. Mendoza TR, Wang XS, Cleeland CS, Morrissey M, Johnson BA, Wendt JK, et al. The rapid assessment of fatigue severity in cancer patients: use of the Brief Fatigue Inventory. Cancer 1999;85(5):1186–96. [CrossRef]
14. Paddison JS, Booth RJ, Hill AG, Cameron LD. Comprehensive assessment of peri-operative fatigue: development of the Identity-Consequence Fatigue Scale. J Psychosom Res 2006;60(6):615–22. [CrossRef]
15. Fisk JD, Ritvo PG, Ross L, Haase DA, Marrie TJ, Schlech WF. Measuring the functional impact of fatigue: initial validation of the fatigue impact scale. Clin Infect Dis 1994;18 Suppl 1:S79–83. [CrossRef]
16. Smets EM, Garssen B, Bonke B, De Haes JC. The Multidimensional Fatigue Inventory (MFI) psychometric qualities of an instrument to assess fatigue. J Psychosom Res 1995;39(3):315–25. [CrossRef]

17. Vercoulen JH, Swanink CM, Fennis JF, Galama JM, van der Meer JW, Bleijenberg G. Dimensional assessment of chronic fatigue syndrome. J Psychosom Res 1994;38(5):383–92. [CrossRef]
18. Krupp LB, LaRocca NG, Muir-Nash J, Steinberg AD. The fatigue severity scale. Application to patients with multiple sclerosis and systemic lupus erythematosus. Arch Neurol 1989;46(10):1121–3. [CrossRef]
19. Piper BF, Dibble SL, Dodd MJ, Weiss MC, Slaughter RE, Paul SM. The revised Piper Fatigue Scale: psychometric evaluation in women with breast cancer. Oncol Nurs Forum 1998;25(4):677–84. [CrossRef]
20. Al-shair K, Kolsum U, Berry P, Smith J, Caress A, Singh D, et al. Development, dimensions, reliability and validity of the novel Manchester COPD fatigue scale. Thorax 2009;64(11):950–5. [CrossRef]
21. Revicki DA, Meads DM, McKenna SP, Gale R, Glendenning G, Pokrzywinski RF. COPD and asthma fatigue scale (CAFS): development and psychometric assessment. Health Outcomes Res Med. 2010;1(1):e5–16. [CrossRef]
22. Herdman M, Fox-Rushby J, Badia X. A model of equivalence in the cultural adaptation of HRQoL instruments: the universalist approach. Qual Life Res 1998;7(4):323–35. [CrossRef]
23. 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(24):3186–91. [CrossRef]
24. Mokkink LB, Terwee CB, Patrick DL, Alonso J, Stratford PW, Knol DL, et al. The COSMIN checklist for assessing the methodological quality of studies on measurement properties of health status measurement instruments: an international Delphi study. Qual Life Res 2010;19(4):539–49. [CrossRef]
25. Cella DF, Tulsky DS, Gray G, Sarafian B, Linn E, Bonomi A, et al. The Functional Assessment of Cancer Therapy scale: development and validation of the general measure. J Clin Oncol 1993;11(3):570–9. [CrossRef]
26. Cella D, Eton DT, Lai JS, Peterman AH, Merkel DE. Combining anchor and distribution-based methods to derive minimal clinically important differences on the Functional Assessment of Cancer Therapy (FACT) anemia and fatigue scales. J Pain Symptom Manage 2002;24(6):547–61. [CrossRef]
27. Reishtein JL. Relationship between symptoms and functional performance in COPD. Res Nurs Health 2005;28(1):39–47. [CrossRef]
28. Spruit MA, Singh SJ, Garvey C, ZuWallack R, Nici L, Rochester C, et al.; ATS/ERS Task Force on Pulmonary Rehabilitation. An official American Thoracic Society/European Respiratory Society statement: key concepts and advances in pulmonary rehabilitation. Am J Respir Crit Care Med 2013;188(8):e13–64. Erratum in: Am J Respir Crit Care Med 2014;189(12):1570.
29. Lewko A, Bidgood PL, Garrod R. Evaluation of psychological and physiological predictors of fatigue in patients with COPD. BMC Pulm Med 2009;9:47. [CrossRef]
30. Can G, Durna Z, Aydiner A. Assessment of fatigue in and care needs of Turkish women with breast cancer. Cancer Nurs 2004;27(2):153–61. [CrossRef]
31. Arslan S, Oztunç G. Validity and reliability of chronic obstructive pulmonary disease and asthma fatigue scale. J Res Develop Nurs 2013;15(1):48–60. Turkish.
32. Bestall JC, Paul EA, Garrod R, Garnham R, Jones PW, Wedzicha JA. Usefulness of the Medical Research Council (MRC) dyspnoea scale as a measure of disability in patients with chronic obstructive pulmonary disease. Thorax 1999;54(7):581–6. [CrossRef]
33. Yorgancıoğlu A, Polatlı M, Aydemir Ö, Yılmaz Demirci N, Kırkıl G, Naycı Atış S, et al. Reliability and validity of Turkish version of COPD assessment test. Tuberk Toraks 2012;60(4):314–20. Turkish. [CrossRef]
34. Polatlı M, Yorgancıoğlu A, Aydemir Ö, Yılmaz Demirci N, Kırkıl G, Atış Naycı S, et al. Validity and reliability of Turkish version of St. George's respiratory questionnaire. Tuberk Toraks 2013;61(2):81–7. Turkish. [CrossRef]
35. Tatar A, Saltukoglu G. The adaptation of the CES-Depression Scale into Turkish through the use of confirmatory factor analysis and item response theory and the examination of psychometric characteristics. Bull Clin Psychopharmacol 2010;20(3):213–27. [CrossRef]
36. FACIT.org. FACIT-F: Functional Assessment of Chronic Illness Therapy-Fatigue. Accessed April 7, 2026. https://www.facit.org/measures/FACIT-F
37. Hair JF, Anderson RE, Tatham RL, Black WC. Multivariate data analyses with readings. 4th ed. New Jersey: Pearson College Division; 1995.
38. Kline P. Psychometrics and psychology. London: Academic Press Inc.; 1979.
39. Tavakol M, Dennick R. Making sense of Cronbach's alpha. Int J Med Educ 2011;2:53–5. [CrossRef]
40. Koo TK, Li MY. A Guideline of Selecting and Reporting Intraclass Correlation Coefficients for Reliability Research. J Chiropr Med 2016;15(2):155–63. Erratum in: J Chiropr Med 2017;16(4):346. [CrossRef]
41. Aaronson N, Alonso J, Burnam A, Lohr KN, Patrick DL, Perrin E, et al. Assessing health status and quality-of-life instruments: attributes and review criteria. Qual Life Res 2002;11(3):193–205. [CrossRef]
42. Cella D, Yount S, Sorensen M, Chartash E, Sengupta N, Grober J. Validation of the Functional Assessment of Chronic Illness Therapy Fatigue Scale relative to other instrumentation in patients with rheumatoid arthritis. J Rheumatol 2005;32(5):811–9.
43. Hagell P, Höglund A, Reimer J, Eriksson B, Knutsson I, Widner H, et al. Measuring fatigue in Parkinson's disease: a psychometric study of two brief generic fatigue questionnaires. J Pain Symptom Manage 2006;32(5):420–32. [CrossRef]
44. Williams-Hall R, Berry P, Williamson N, Barclay M, Roberts A, Gater A, et al. Generation of evidence supporting the content validity of SF-36, FACIT-F, and LupusQoL, and novel patient-reported symptom items for use in patients with systemic lupus erythematosus (SLE) and SLE with lupus nephritis (LN). Lupus Sci Med 2022;9(1):e000712. [CrossRef]
45. Signorovitch J, Brainsky A, Grotzinger KM. Validation of the FACIT-fatigue subscale, selected items from FACT-thrombocytopenia, and the SF-36v2 in patients with chronic immune thrombocytopenia. Qual Life Res 2011;20(10):1737–44. [CrossRef]
46. Al Maqbali M, Hughes C, Gracey J, Rankin J, Hacker E, Dunwoody L. Psychometric Properties of the Arabic Version of the Functional Assessment of Chronic Illnesses Therapy-Fatigue in Arabic Cancer Patients. J Pain Symptom Manage 2020;59(1):130–8.e2. [CrossRef]
47. Montan I, Löwe B, Cella D, Mehnert A, Hinz A. General Population Norms for the Functional Assessment of Chronic Illness Therapy (FACIT)-Fatigue Scale. Value Health 2018;21(11):1313–21. [CrossRef]
48. Correa GP, Oliveira CC, Vieira GC, Cabral LF, Malaguti C, Jose A. Validity of the Functional Assessment of Chronic Illness Therapy Fatigue Scale (FACIT-F) in individuals with Chronic Obstructive Pulmonary Disease in Brazil. Fisioter Pesqui 2024;31:e23001924en. [CrossRef]
49. Workman B, Nabors L. Risk Factors for Adults with Chronic Obstructive Pulmonary Disease in the United States, Utilizing State-Based Surveillance. COPD 2024;21(1):2413712. [CrossRef]