DOI: 10.1590/1809-2950/e23001924en

ORIGINAL RESEARCH

Validity of the Functional Assessment of Chronic Illness Therapy Fatigue Scale (FACIT-F) in individuals with Chronic Obstructive Pulmonary Disease in Brazil

Validade da Escala de Fadiga, Functional Assessment Of Chronic Illness Therapy Fatigue Scale (FACIT-F) em indivíduos com Doença Pulmonar Obstrutiva Crônica no Brasil

Validación de la Escala de Fatiga, Functional Assessment Of Chronic Illness Therapy Fatigue Scale (FACIT-F) en individuos con enfermedad pulmonar obstructiva crónica en Brasil

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ABSTRACT | Fatigue is one of the most prevalent symptoms in individuals with Chronic Obstructive Pulmonary Disease (COPD), but it is poorly evaluated. The Functional Assessment of Chronic Illness Therapy Fatigue Scale (FACIT-F) is one of the main instruments used to measure fatigue. However, this instrument has not yet been validated for the Brazilian population with COPD. This study aimed to investigate the validity of the FACIT-F fatigue scale in individuals with COPD. In a cross-sectional study, the impact of symptoms (COPD Assessment Test – CAT), dyspnea (modified Medical Research Council – MRC scale), functional capacity (six-minute step test – 6MST), exertional fatigue (Borg modified scale at the end of 6MST), and the FACIT-F scale to assess multidimensional fatigue were evaluated. Concurrent validity was assessed by associating the FACIT-F with the CAT, and convergent validity by associating it with the number of steps, perceived exertional fatigue, and dyspnea. Discriminant validity was assessed by comparing fatigue with the dyspnea severity strata. In total, 92 participants were studied (69.9±8.8 years, FEV_1: 48.4% of predicted). The FACIT-F presented an average of 30.1±10.9 points, strong concurrent validity with the CAT (r=-0.80), strong convergent validity with dyspnea (r=−0.66), and low with exercise capacity (r=0.40) and fatigue on exertion (r=-0.44). FACIT-F was effective in discriminating groups with different intensities of dyspnea. Conclusion: The FACIT-F is a valid tool for assessing fatigue in the Brazilian population with COPD.

Keywords | Chronic Obstructive Pulmonary Disease; Fatigue; Exercise Tolerance.

RESUMO | A fadiga é um dos sintomas mais prevalentes nos indivíduos com Doença Pulmonar Obstrutiva Crônica (DPOC), porém, ainda é pouco avaliada. Um dos principais instrumentos utilizados para mensurar a fadiga é a *functional assessment of chronic illness therapy fatigue scale* (FACIT-F). Entretanto, este instrumento ainda não foi validado para a população com DPOC no Brasil.

Paper presented at the XX International Symposium on Respiratory Physical therapy and Physiotherapy in Intensive Care. Florianópolis/SC. Institution: ASSOBRAFIR;
XIX São Paulo Congress of Pulmonology and Phthisiology. Online. Institution: SPPT.

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Financing source: nothing to declare – Conflict of interest: nothing to declare – Presentation: May 13th, 2023 – Accepted for publication: Aug. 25th, 2023 –
Approved by the Research Ethics Committee: Opinion No. 4.454.082

Dessa forma, o objetivo deste estudo foi investigar a validade da escala de fadiga Facit-F em indivíduos com DPOC. Em um estudo transversal, foram avaliados o impacto dos sintomas (COPD Assessment Test – CAT), a dispneia (escala do *Medical Research Council* – MRC modificada), a capacidade funcional (teste do degrau de seis Minutos – TD6), a fadiga no esforço (escala de Borg modificada ao final do TD6) e a escala Facit-F para avaliar a fadiga multidimensional. A validade concorrente foi avaliada pela associação da escala com o CAT, e a validade convergente pela associação desta com o número de degraus, percepção de fadiga no esforço e a dispneia. A validade discriminante foi avaliada comparando a fadiga com os estratos da gravidade da dispneia. Foram estudados 92 participantes (69,9±8,8 anos, VEF_1: 48,4% do previsto). A Facit-F apresentou uma média de 30,1±10,9 pontos, validade concorrente forte com o CAT (r=-0,80), validade convergente forte com a dispneia (r= -0,66) e baixa com a capacidade de exercício (r=0,40) e com a fadiga ao esforço (r= -0,44). A Facit-F foi eficaz em discriminar grupos com diferentes intensidades de dispneia, portanto é um instrumento válido para a avaliação da fadiga na população brasileira com DPOC.

Descritores | Doença Pulmonar Obstrutiva Crônica; Fadiga; Tolerância ao Exercício.

RESUMEN | La fatiga es uno de los síntomas más frecuentes en los individuos con enfermedad pulmonar obstructiva crónica (EPOC), pero su evaluación sigue siendo deficiente. Uno de los principales instrumentos utilizados para medir la fatiga es la *Functional assessment of chronic illness therapy fatigue scale* (FACIT-F). Sin embargo, este instrumento aún no ha sido validado para la población con EPOC en Brasil. En este contexto, el objetivo de este estudio fue investigar la validez de la escala de fatiga FACIT-F en individuos con EPOC. El estudio transversal evaluó el impacto de los síntomas (COPD Assessment Test –CAT), de la disnea (escala modificada del Consejo de Investigación Médica –MRC), de la capacidad funcional (prueba de pasos de seis minutos –6MST), de la fatiga de esfuerzo (escala modificada de Borg al final de la 6MST) y de la escala FACIT-F para evaluar la fatiga multidimensional. La validez concurrente se evaluó asociando la escala con el CAT, y la validez convergente la asoció con el número de pasos, la fatiga al esfuerzo percibida y la disnea. La validez discriminante se evaluó comparando la fatiga con los estratos de gravedad de la disnea. Se estudió a 92 participantes (69,9±8,8 años, VEF1: 48,4% del predicho). La FACIT-F tuvo una puntuación media de 30,1±10,9, fuerte validez concurrente con el CAT (r=-0,80), fuerte validez convergente con la disnea (r=-0,66) y baja con la capacidad de ejercicio (r=0,40) y con la fatiga de esfuerzo (r=-0,44). La FACIT-F fue eficaz para distinguir grupos con diferentes intensidades de disnea, por lo que muestra ser un instrumento válido para evaluar la fatiga en la población brasileña con EPOC.

Palabras clave | Enfermedad Pulmonar Obstructiva Crónica; Fatiga; Tolerancia al Ejercicio.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a preventable and treatable respiratory disease characterized by chronic airflow obstruction. Airflow limitation is generally progressive and associated with an abnormal inflammatory response of the lungs to harmful particles or gases[1].

In addition to pulmonary alterations, fatigue is associated with peripheral muscle dysfunction, caused by the systemic inflammatory response, oxidative stress, a reduction in anabolic hormones, hypoxemia and hypercapnia, use of corticosteroids, malnutrition, and a sedentary lifestyle[2].

Fatigue ranges from 17% to 95% in individuals with COPD[3,4], presenting a high prognostic value for both morbidity and mortality[5]. It is a disabling symptom, represented by a subjective feeling of tiredness or exhaustion, which can occur both at rest and when performing an activity that requires physical effort[3,4].

However, despite its high prevalence, fatigue is a symptom that has been insufficiently explored and evaluated in this population[6]. One of the instruments available to measure it is the Functional Assessment of Chronic Illness Therapy – Fatigue scale (FACIT-F), a scale that encompasses physical, functional, and emotional fatigue, as well as its social consequences[7]. However, this instrument has not yet been validated for the Brazilian population with COPD, limiting its applicability, so its validation could help health professionals to properly assess fatigue, as well as in proposing therapeutic interventions and evaluating the response to rehabilitation.

This study aimed to investigate the concurrent, convergent, and discriminant validity of the FACIT-F fatigue scale for use in Brazilian individuals with COPD.

METHODOLOGY

Study design

Cross-sectional study conducted in a public tertiary care hospital, in accordance with the guidelines of the consensus-based standards for the selection of health measurement instruments (Cosmin)[8]. All participants signed an informed consent form.

Participants

Clinically stable individuals with COPD and no other respiratory diseases were included[1]. Participants were recruited among those referred to a pulmonary rehabilitation program. Individuals who were illiterate, had cognitive impairments, unstable cardiovascular disease, neurological or musculoskeletal sequelae that prevented the study procedures from being carried out were excluded from the study. The sample size followed the Cosmin guidelines[8], which classifies a sample of 50 to 99 participants as good for validation studies.

Procedures

In a single visit, the individual's sociodemographic and clinical characteristics, their pulmonary function (spirometry), the impact of COPD symptoms on them (COPD assessment test questionnaire – CAT), their dyspnea (modified Medical Research Council scale – mMRC), and their tolerance to exertion (six-minute step test – 6MST) were assessed. In addition, the FACIT-F fatigue scale was applied.

Spirometry was performed in accordance with the Brazilian guidelines for assessing pulmonary function[9,10]. Forced expiratory volume in one second (FEV_1), forced vital capacity (FVC), and the FEV_1/FVC ratio were recorded. COPD severity was stratified according to the global initiative for chronic obstructive lung disease (GOLD)[1].

The CAT is an instrument that evaluates the impacts of the disease on the individual's life. It consists of eight items and its total score ranges from 6 to 40 points; the higher the score, the greater the impact caused by the disease[11].

To assess dyspnea, the MRCm scale[12] was used, which is composed of five activities in which the dyspnea score ranges from 0 to 4. The higher the score, the more dyspnea limits activities of daily living. For the discriminant validity analysis, the symptom was classified as mild (0 to 2 points) or severe (3 or 4 points).

The 6MST was performed to assess exercise capacity. The test consists of climbing up and down a single 20cm-high step as quickly as possible for six minutes and its main outcome is the number of steps climbed[13]. The test result was compared with normality values[14]. Before and immediately after the 6MST, the perception of fatigue was assessed using the modified Borg scale, an instrument composed of a scale ranging from 0 to 10, with 0 corresponding to no fatigue and 10 to maximum fatigue[15].

The FACIT-F is an instrument developed in 1997, initially used to measure fatigue in cancer patients with anemia[7]. It is an autonomous questionnaire based on the functional assessment of cancer therapy (FACIT)[16], but which has been validated and considered an independent and reliable instrument[7]. The FACIT-F is a scale that assesses fatigue involving physical, functional, and emotional aspects and its social consequences. The instrument consists of 13 questions, each with five answer alternatives, which are scored on a scale from 0 (not at all) to 4 (very much). The total score ranges from 0 to 52 points, and higher scores indicate less fatigue[7].

Statistical analysis

The data were analyzed using SPSS Statistics 20.0 program. The Shapiro-Wilk test was applied to test the normality of the variables: numerical variables with normal distribution were presented as mean and standard deviation; those with an asymmetric distribution were expressed as median and interquartile range; and categorical variables were presented as absolute numbers and percentages.

Concurrent validity was assessed by correlating the total score obtained on the FACIT-F with that obtained on the CAT. For convergent validity, the total FACIT-F score was correlated with the 6MST results, the fatigue presented at the end of the 6MST, and the score on the mMRC scale. Pearson's correlation analysis was used for variables with a normal distribution and Spearman's correlation for those with an asymmetric distribution. The correlations were interpreted according to the following classification: 0 to 0.3: negligible correlation; 0.3 to 0.5: low correlation; 0.5 to 0.7: moderate correlation; 0.7 to 0.9: high correlation; and 0.9 to 1.0: very high correlation[17]. Student's t-test for independent samples was used for discriminant validity. A 5% significance level was considered for all tests.

RESULTS

In total, 117 participants were recruited for the study. Of these, 25 individuals were excluded: nine for having spirometry incompatible with COPD, eight for not being able to perform the 6MST, three for being illiterate, two for cognitive impairment, two for dropping out, and one for not being able to perform spirometry testing.

The participants had a mean age of 69.9±8.9 years, 60.9% were female, and FEV_1: 50.2±20% of predicted. Table 1 show the other characteristics of the sample.

Table 1. Sample characteristics

Characteristic	N=92
Age, years	69.9±8.9
Female, n(%)	56 (60.9)
BMI (kg/m²)	26.8 (23.2–32.2)
FEV_1, % pred.	50.2±20
FVC, % pred.	64.3±21.42
FEV_1/FVC, %	59.5±11.5
GOLD classification, n	
n with 1, 2, 3, 4	10, 34, 34, 14
Smoking	
Smokers, n(%)	18 (19.6)
Former smokers, n(%)	70 (76.1)
Non-smokers, n (%)	4 (4.3)
Comorbidities	
SAH, n (%)	72 (78.3)
Dyslipidemia, n(%)	49 (53.3)
Diabetes, n(%)	32 (34.8)
Continuous oxygen therapy, n(%)	43 (46.7)

BMI: Body mass index; FEV_1: Forced expiratory volume in one second FVC: Forced vital capacity; SAH: Systemic arterial hypertension

The total score of the FACIT-F scale showed a mean of 30.1±10.9 points, performance on the 6MST was 67.8±26.1 steps (59.9±24.9% of predicted), fatigue on exertion at the end of the 6MST was 5 (3–7) points, the total score on the CAT was 18.1±10.9 points, and on the MRC was 2 (1–3) points.

For the concurrent validity analysis, the total FACIT-F score showed a strong correlation with the CAT score (r=–0.8). In the convergent validity analysis, the total FACIT-F score correlated positively with the number of steps on the 6MST and negatively with exertional fatigue and dyspnea (Table 2).

Table 2. Concurrent and convergent validity of the FACIT-F and independent variables

Concurrent validity	Convergent validity		
CAT	6MST (no. Steps)	Fatigue on exertion	Dyspnea on activities
–0.80*	0.40*	–0.44*	–0.66*

Abbreviations: CAT COPD assessment test; 6MST: six-minute step test. *p<0.05

The total FACIT-F score showed a significant difference when comparing the stratified groups with mild and severe dyspnea by the MRC (Table 3).

Table 3. Discriminant Validity: comparison between FACIT-F and dyspnea strata.

	Mild dyspnea			Severe dyspnea			
	Mean	SD	Min-Max	Mean	SD	Min-Max	*P*
FACIT-F, total	34.5	9.8	12–52	21.9	7.4	9–35	<0.001

DISCUSSION

This study performed concurrent, convergent, and discriminant validation on the FACIT-F fatigue scale in Brazilian individuals with COPD. Our results demonstrate that the scale is a valid instrument for assessing fatigue in this population and is capable of discriminating between individuals with mild and severe symptoms.

There are a few instruments available to assess fatigue[18], however, the existing ones present one or more of the following limitations: 1) they have not been translated into Portuguese and culturally adapted for use in the Brazilian population; 2) they are one-dimensional and do not provide the necessary scope to assess essential aspects such as the physical, mental, and social impact of fatigue; or 3) their measurements have not been tested and they hold no validation for use in the Brazilian population with COPD.

The validation of the FACIT-F fatigue scale could fill this gap, since it encompasses physical, functional, and emotional fatigue and their social consequences. It can be self-administered or conducted by an interview, is easy to use, cheap, and can be applied in different clinical and research contexts[7]. In addition, because it contains few items, it is shorter than other multidimensional questionnaires used to assess fatigue. FACIT-F has already been administered to British individuals with COPD and has proven to be a valid and reliable instrument for assessing fatigue in this population[19].

In our study, concurrent validity was assessed by the strong association between the FACIT-F and the CAT—a tool capable of measuring the impact of COPD on the lives of individuals[20]. This survey provides a standardized assessment of various activities that are particularly affected in individuals with COPD, activities that are directly impacted by the perception of fatigue[11].

Our study demonstrated a low association between FACIT-F and the number of steps climbed in the 6MST and exertional fatigue, indicating that individuals with a high score for this symptom in daily activities also have poor tolerance to exertion and fatigue during exercise. The 6MST is more strenuous than the 6-minute walk test, due to the additional work involved in vertical displacement against gravity[21]. This can be particularly interesting for assessing fatigue, as it makes the perception of this symptom more evident. The characteristics of the 6MST allow it to be used as a comparison to build the validation of other functional tests[22].

The FACIT-F scale showed a moderate correlation with dyspnea and was effective in discriminating the groups of individuals with sensations other than the symptom, stratified as mild or severe. The sensation of fatigue is usually associated with dyspnea[23], because as the disease progresses and airway becomes more obstructed, systemic manifestations and changes in the peripheral muscles become more pronounced, worsening symptoms and leading individuals to experience greater fatigue[24].

Successful COPD treatment and disease management requires an adequate assessment of fatigue, understanding how this symptom affects individuals. Untreated fatigue is associated with a progressive decrease in functional capacity, physical inactivity, increased dyspnea, impact of symptoms, burden of disease, incidence of exacerbations, depression, and reduced quality of life[2,3,23-25]. With a proper assessment, health professionals will be able to develop therapeutic strategies aimed at reducing this symptom and its consequences. Our study confirms the validity of the FACIT-F scale for use in the Brazilian population with COPD, making this instrument available for clinical and scientific purposes, and enabling an adequate assessment and follow-up of fatigue in this population.

This study holds some limitations as it is a single-center study, so caution is advised when inferring the same results for individuals from other locations. However, our sample is considered adequate and was able to include a range of individuals with different disease severities. Since the reproducibility and responsiveness of the FACIT-F scale were not assessed, future studies are recommended to evaluate these measurement properties.

CONCLUSION

The FACIT-F scale is a valid instrument for assessing fatigue in the Brazilian population with COPD. This validation makes the instrument available for use in clinical and scientific contexts, providing an adequate assessment of fatigue and its impact on activities of daily living.

ACKNOWLEDGEMENTS

The authors would like to thank Joice Gomide Nolasco de Assis and all the volunteers who participated in this study.

REFERENCES

1. Global Iniciative for Chronic Obstructive Lung Disease. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. Fontana: GOLD; 2022 [cited 23 ago. 2023]. Available from: https://goldcopd.org/2022-gold-reports/
2. Maltais F, Decramer M, Casaburi R, Barreiro E, Burelle Y, et al. An official American Thoracic Society/European Respiratory Society statement: update on limb muscle dysfunction in chronic obstructive pulmonary disease. Am J Respir Crit Care Med. 2014;189(9):e15-62. doi: 10.1164/rccm.201402-0373st
3. Ebadi Z, Goërtz YMJ, Van Herck M, Janssen DJA, Spruit MA, et al. The prevalence and related factors of fatigue in patients with COPD: a systematic review. Eur Respir Rev. 2021;30(160):200-98. doi: 10.1183/16000617.0298-2020
4. Baltzan MA, Scott AS, Wolkove N, Bailes S, Bernard S, et al. Fatigue in COPD: prevalence and effect on outcomes in pulmonary rehabilitation. Chron Respir Dis. 2011;8(2):119-28. doi: 10.1177/1479972310396737
5. Antoni SA, Ungureanu D. Measuring fatigue as a symptom in COPD: From descriptors and questionnaires to the importance of the problem. Chron Respir Dis. 2015;2(3):179-88. doi: 10.1177/1479972315575716.
6. Spruit M, Vercoulen J, Sprangers M, Wouters ET. Fatigue in COPD: an important yet ignored symptom. Lancet Respir Med. 2017;5(7):542-4. doi: 10.1016/S2213-2600(17)30158-3
7. Montan I, Lowe 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. doi: 10.1016/j.jval.2018.03.013

8. Mokkink L, Terwee CB, Patrick DL, Alonso J, Stratford PW, 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. doi: 10.1007/s11136-010-9606-8

9. Pereira CAC, Neder JA. Diretrizes para testes de função pulmonar. J Bras Pneumol. 2002;28(Suppl 3). https://www.jornaldepneumologia.com.br/details-supp/45.

10. Pereira C, Sato T, Rodrigues S. New reference values for forced spirometry in white adults in Brazil. J Bras Pneumol. 1992;18(1):10-22. doi: 10.1590/S1806-37132007000400008

11. Silva GPF, Morano MTAP, Viana CMS, Magalhães CBA, Pereira EDB. Portuguese-language version of the COPD Assessment Test: validation for use in Brazil. J Bras Pneumol. 2013;39(4):402-8. doi: 10.1590/S1806-37132013000400002

12. Kovelis D, Segretti NO, Probst VS, Lareau SC, Brunetto AF, et al. Validation of the Modified Pulmonary Functional Status and Dyspnea Questionnaire and the Medical Research Council scale for use in Brazilian patients with chronic obstructive pulmonary disease. J Bras Pneumol. 2008;34(12):1008-10. doi: 10.1590/s1806-37132008001200005

13. Costa JNF, Arcuri JF, Gonçalves IL, Davi SF, Pessoa BV, et al. Reproducibility of cadence-free 6-minute step test in subjects with COPD. Respir Care. 2014;59(4):538-42. doi: 10.4187/respcare.02743

14. Arcuri JF, Borghi-Silva A, Labadessa IG, Sentanin AC, Candolo C, et al. Validity and Reliability of the 6-Minute Step Test in Healthy Individuals: A Cross-sectional Study. Clin J Sport Med. 2016;26(1):69-75. doi: 10.1097/JSM.0000000000000190

15. Borg GA. Psychophysical bases of perceived exertion. Med Sci Sports Exerc. 1982;14(5):377-81.

16. Yellen SB, Cella DF, Webster K, Blendowski C, Kaplan E. Measuring fatigue and other anemia-related symptoms with the Funcional Assessment of Cancer Therapy (FACT) Measurement System. J Pain Symptom Manage. 1997;13:63-74. doi: 10.1016/s0885-3924(96)00274-6

17. Hinkle DE, Wiersma W, Jurs SG. Applied Statistics for the Behavioral Sciences. 5th ed. Boston: Houghton Mifflin; 2003.

18. Machado MO, Kang NC, Tai F, Sambhi RDS, Berk M, et al. Measuring fatigue: a meta-review. Int J Dermatol. 2021;60(9):1053-69. doi: 10.1111/ijd.15341

19. Al-Shair K, Muellerova H, Yorke J, Rennard SI, Wouters EF, et al. Examining fatigue in COPD: development, validity and reliability of a modified version of FACIT-F scale. Health Qual Life Outcomes. 2012;10:100. doi: 10.1186/1477-7525-10-100

20. Tsiligianni IG, Van Der Molen T, Moraitaki D, Lopez I, Kocks JW, et al. Assessing health status in COPD. A head-to-head comparison between the COPD assessment test (CAT) and the clinical COPD questionnaire (CCQ). BMC Pulm Med. 2012;12:20. doi: 10.1186/1471-2466-12-20

21. Costa CH, Silva KM, Maiworm A, Raphael Y, Parnayba J, et al. Can we use the 6-minute step test instead of the 6-minute walking test? An observational study. Physiotherapy. 2017;103(1):48-52. doi: 10.1016/j.physio.2015.11.003

22. Pessoa BV, Arcuri JF, Labadessa IG, Costa JNF, Sentanin AC, et al. Validity of the six-minute step test of free cadence in patients with chronic obstructive pulmonary disease. Braz J Phys Ther. 2014;18(3):228-36. doi: 10.1590/bjpt-rbf.2014.0041

23. Baghai-Ravary R, Quint JK, Goldring JJ, Hurst JR, Donaldson GC, et al. Determinants and impact of fatigue in patients with chronic obstructive pulmonary disease. Respir Med. 2009;103(2):216-23. doi: 10.1016/j.rmed.2008.09.022

24. Mollaoglu M, Fertelli T, Tuncay F. Fatigue and disability in elderly patients with chronic obstructive pulmonary disease (COPD). Arch Gerontol Geriatr. 2011;53(2):e93-8. doi: 10.1016/j.archger.2010.07.001

25. Antoniu SA, Petrescu E, Stanescu R, Anisie E, Boiculese L. Impact of fatigue in patients with chronic obstructive pulmonary disease: results from an exploratory study. Ther Adv Respir Dis. 2016;10(1):26-33. doi: 10.1177/1753465815617707.