

Cross-cultural adaptation of the Greek version of post-COVID-19 Functional Status Scale: assessment of non-hospitalised post-COVID-19 survivors

Maria Tsekoura (1), Konstantinos Fousekis (1), Evdokia Billis (1), Yannis Dionyssiotis (2), Elias Tsepis (1)

(1) Department of Physiotherapy, School of Health Rehabilitation Sciences, University of Patras, Rio, Greece; (2) Medical School, University of Patras, Spinal Cord Injury Rehabilitation Clinic, University General Hospital Patras, Rio Patras, Greece.

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Abstract

The objective of the study was to translate and validate into the Greek language and setting the Post-COVID-19 Functional Status (PCFS) scale. Greeks aged ≥ 18 years who recovered from COVID-19 (≥ 14 days since diagnosis), were invited to participate. This cross-sectional study followed international guidelines regarding the translation process (forward and backward) and the evaluation of the PCFS. Reliability was assessed by test–retest analyses using the intraclass correlation coefficient (ICC) and 95%CI. For the validation, all participants completed the European Quality of Life-5 (EQ-5D-5L), and the Hospital Anxiety and Depression Scale (HADS) questionnaire. 82 adults (49 females, aged 40.2 ± 6.1) participated in the study. The Greek version of the PCFS demonstrated excellent test–retest reliability, with an ICC of 0.9 (95% CI 0.90- 0.95). The Cronbach’s alpha value was 0.9, indicating good internal consistency. The PCFS score was strongly correlated with the EQ-5D-5L ($r=0.6$, $p\leq 0.001$) and weakly correlated with the HADS ($r=0.41$; $p\leq 0.001$). The Greek version of the PCFS was successfully adapted into Greek and is recommended to be used across clinical settings and research.

Key Words: COVID-19; functionality; reliability; adaptation.

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COVID-19 is a growing pandemic with initial cases identified in China.¹ Since the first reports of COVID-19 cases at the end of 2019, millions of patients were reported positive in all continents. Several studies have recorded high prevalence rates and great variability in presentations of people diagnosed with the disease.² The clinical features of COVID-19 are variable, ranging from asymptomatic states to acute respiratory distress syndrome and multi-organ dysfunctions.³ Common clinical symptoms include headache, fever, cough, sore throat, fatigue, myalgia, breathlessness and dyspnea.⁴ COVID-19 infection is also seen, ranging from asymptomatic presentations to death.⁵ In addition, most patients with COVID-19 make a full recovery after acute infection with SARS-CoV-2, but a significant proportion still report ongoing health problems.⁶ Literature has shown that patients with severe COVID-19 who survived hospitalization report ongoing symptoms and physical limitations up to several months after discharge.⁷ Many adults have shown disability and deficiencies in physical and cognitive function, fatigue and restrictions in

activities of daily living.⁸ Due to the vast number of patients having the disease and the range of clinical symptoms (during and after COVID-19) the need for ongoing assessments of patients with post-COVID-19 infection has become a major task.⁵ This recent pandemic has greatly affected all aspects of healthcare delivery, creating collateral damage to both, patients and rehabilitation services.⁹ In addition, the rapid spread of the highly contagious variants of SARS-CoV-2 globally has challenged the accessibility and the delivery of physical and rehabilitation services.¹⁰ Given the high number of patients which are recovering from COVID-19, the need for evaluation tools to assess the course and the consequences of the disease as well as its functional limitations is necessary.^{11,12} Klok and colleagues proposed the Post-COVID-19 Functional Status (PCFS) scale to be used as a patient-reported outcome measure to evaluate the consequences of COVID-19 and their effect on functional status.¹³ The PCFS scale has been developed for evaluating functional outcomes of COVID-19 upon discharge and in the long term.¹³ It is a

6-point grading scale, ranging from 0 (“no functional limitations”) to 5 (“death”).¹² The PCFS scale has been translated in many languages and the translation and supporting information are freely accessible via its website [[https://osf.io/qgpdv/\(CC-BY 4.0\)](https://osf.io/qgpdv/(CC-BY 4.0))].¹⁴ However psychometric evaluations have been performed only in a few studies. To date, the PCFS Scale has been translated and validated into Turkish,¹³ Dutch and Belgian populations,¹³ Gujarati (native language of the state of Gujarat in India),¹⁵ French language,¹⁶ Spanish,¹⁷ as well as Mexican-Spanish populations.¹⁸ For Greek populations, there is no valid and reliable disease-specific tool to evaluate functional status after COVID-19. Therefore, the aim of the present study was to translate and cross culturally adapt the PCSF scale into Greek.

Materials and Methods

This cross-sectional survey study was conducted in Greece between August 2022 and January 2023. The study was carried out at the Laboratory of Clinical Physiotherapy and Research (CPR lab), University of Patras. The participants were recruited via open invitation across various rehabilitation centers of Achaia County, Western Greece. Inclusion criteria were individuals: i) who recovered from COVID-19 (≥ 14 days since diagnosis), ii) were aged over 18 years and iii) whose maternal language is Greek. Diagnosis of the COVID-19 was confirmed with the reverse transcription polymerase chain reaction (RT-PCR) test for all participants. People with diagnosis of dementia and/or pre-existing disability were excluded from the study. The study was approved by the Ethics Committee of the University of Patras. All participants were informed about the study’s objective and procedures. They signed an informed consent form prior to their inclusion.

The sample size required for the study was determined as 5 times the number of items used in the scale.¹³

Permission to translate and investigate the psychometric properties of the PCSF scale in Greek was obtained from the developer of the scale. The cross-cultural adaptation of the Greek version of the PCSF was accomplished using standard guidelines.¹⁹ The first phase comprised of the translation process into Greek. The second phase consisted of the evaluation of reliability and validity of the Greek version of the PCSF.

An initial translation was performed independently by 2 professional bilingual translators from English to Greek (forward translation). The two forward translations were synthesized and produced the first Greek version of the PCFS. This ‘synthesis’ version was back translated in English by one independent bilingual translator, who was blinded to the original English version. An expert committee compared the backward translation with the original questionnaire and produced the pre-final Greek PCFS version (PCFS_{GR}). Then, a pilot study was performed, administering the pre-final PCFS_{GR} to 10 adults with variable educational levels for ensuring comprehension and understanding of the questionnaire.

Following this, all translators discussed the comments made in a meeting and the final version of the Greek PCFS scale was developed.

The PCFS_{GR} was administered to a population of post-COVID-19 patient-volunteers to test its psychometric properties: test-retest reliability, internal consistency and construct validity.

Reliability relates to the consistency of a measure over time.¹⁸ The test-retest reliability of the PCFS_{GR} scale was re-assessed approximately 7 days after the first administration. The intraclass correlation coefficient (ICC 2,1) was used to test the reliability between the two administrations of the scale. Internal consistency was also recorded, in order to estimate the questionnaire’s homogeneity.²⁰

The validity of a measurement tool determines whether the tool truly measures what it was intended to measure.^{21,22} For the validation analysis, scores obtained from the initial administration were used. Functional status through the PCFS_{GR} scale, health-related quality of life through the EuroQol-5D questionnaire, and psychological state via the Hospital Anxiety and Depression Scale were measured and correlated.

Functional status was assessed via the PCSF_{GR} scale. The scale stratifies functional status limitation as follows: grade 0 (No functional limitations), grade 1 (Negligible functional limitations), grade 2 (Slight functional limitations), grade 3 (Moderate functional limitations), grade 4 (severe functional limitations); and grade 5 (death).¹⁰

Quality of life (QoL) was assessed via the Greek version of the European Quality of Life-5 Dimensions questionnaire (EQ-5D-5L).²¹ This questionnaire consists of 5 dimensions (mobility, self-care, usual activities, pain/discomfort and anxiety/depression) with 5 response options based on severity level, ranging from 1 to 5.^{23,24} Levels of anxiety and depression were assessed via the Greek version of the Hospital Anxiety and Depression Scale (HADS).²⁵ The scale consists of 14 items, divided into 2 7-point subscales for anxiety and depression with scores ranging from 0 to 21 for each subscale.²⁶

All the statistical analyses were conducted using the SPSS (Version 26.0). Continuous data were expressed with mean \pm standard deviation (SD) and minimum-maximum, and categorical variables were reported with frequency and percentages (%). Internal consistency of PCFS_{GR} was assessed with Cronbach’s α coefficient. Test-retest reliability was tested using ICC2,1.²⁷ Values between 0.70 and 0.80 demonstrated good internal consistency and values above 0.80 indicate very good to excellent internal consistency.²⁸ Construct validity was assessed by analyzing the correlations between the scores of the PCFS_{GR} scale form with those obtained for quality of life (EQ-5D-5L), and psychological status (HADS). To measure correlation between the PCFS and other questionnaires, Pearson correlation coefficient for normally distributed data was used. Normality of

Table 1. Participants' characteristics (n=82).

Variable	Post COVID-19 individuals Mean±SD
Age	40.2 ± 6.1
Weight	67.3 ± 14.5
Height	167.9 ± 8.8
BMI	24.0 ± 5.1
EQ-5D-5L Index total score (0-1)	0.8±7
Visual Analogue Scale (0-100)	79.7±7
HADS Anxiety	10.4±2.5
Depression	6.7±2.8
	4.8±2.9
	Frequency (percentages)
Gender	
Females	54 (65.8%)
Males	28 (34.1%)
Smoking status	
Non smokers	51 (62.1%)
Smokers	11 (13.4%)
Ex smokers	20 (24.4%)
PCFS GR scores	
Grade 0	40 (48.8%)
Grade 1	17 (20.7%)
Grade 2	18 (22%)
Grade 3	7 (8.5%)
Grade 4	0 (0%)

BMI: Body Mass Index; PCFS: Post COVID Functional Status Scale; EQ-5D-5L: European Quality of Life-5 Dimensions questionnaire; HADS: Hospital Anxiety and Depression Scale

continuous variables was tested with the Shapiro–Wilk test. Statistical significance was set at $p < 0.05$.

Results

Eighty two participants (54 females, 28 males; aged 40.2 ± 6.1) were included in the present study. All participants were treated as outpatients. In PCFS GR, 40 participants had no functional limitations, 17 had negligible limitations, 18 had slight limitations and 7 had moderate

functional limitations. Participants' characteristics are presented in Table 1.

The translation was performed with no major difficulties. After the pretest (pilot) assessment, no problems were reported across translators and thus, no further amendments of the PCFS were required.

The translated Greek version of the PCFS demonstrated excellent test–retest reliability, with an ICC of 0.9 (95% CI 0.90- 0.95). The Cronbach's alpha value of the PCFS

Table 2. Correlations between functional limitations, quality of life and psychological status.

	HADS		EQ 5D Total score	EQ 5D	
	Anxiety	Depression		index	VAS
PCFS	r = 0.37 *	r = 0.4 *	r = 0.4 *	r=0.6**	r=0.5*

PCFS: Post COVID Functional Status Scale; EQ-5D-5L: European Quality of Life-5 Dimensions questionnaire; HADS: Hospital Anxiety and Depression Scale; * $p < 0.05$; ** $p < 0.001$

was recorded as 0.9 indicating that the scale is highly reliable.

PCFS_GR score were strongly correlated with the EQ-5D-5L ($r = 0.6, p \leq 0.001$); and moderately to weakly correlated with the HADS (total score $r = 0.4, p = 0.003$; anxiety: $r = 0.3, p = 0.003$; depression: $r = 0.4, p = 0.002$) (Table 2).

Discussion

The current study aimed to perform the cultural adaptation of the PCFS questionnaire into Greek (PCFS_GR) and to investigate its psychometric properties. Ten individuals participated in a pilot study, for testing the comprehensibility of the pre-final Greek version of the PCFS scale and 82 individuals participated in the development of its psychometric properties. Results from the Greek participants showed that the scale was comprehensible, quick and easy to respond to, and that the content was adequate for assessing their post-COVID-19 functional status. These results are in concordance with those published across other language settings.^{11,12,17} Overall, the results showed satisfactory psychometric characteristics of the translated PCFS questionnaire. This study demonstrated that the PCFS_GR is reliable and has high internal consistency. These results are in agreement with those published for the original version of the Scale by Klok et al.¹² as well as the Turkish version.¹³

PCFS scale is a simple tool developed recently in order to assess functional status in COVID-19 survivors.¹² The consequences of COVID-19 may vary extensively among patients. The Greek version of the scale will benefit Greek clinicians and researchers to assess functional limitation in patients post COVID-19 infection. Various factors may influence the functional rehabilitation of post-COVID-19 patients and may affect performance during therapeutic interventions.²⁷ Especially older adults experience persistent symptoms post-COVID-19, termed as long COVID, affecting their physical and mental health.^{28,29} Long COVID is defined as persistent symptoms experienced in recovered patients from COVID-19 causing substantial disease burden.³⁰ In addition, patients with COVID-19 admitted to Intensive Care Units (ICUs) may have functional impairments; requiring treatment to fix the disability. Functional limitations must be assessed and multidisciplinary interventions must be designed in order to minimize disabilities and improve functional independence in patients recovering from COVID-19.³¹ Functional status of the Greek participants showed a strong correlation with quality of life ($r > 0.60$) and lower correlations with HADS. A key element that may explain those correlations may be the fact that the total sample consisted of non-hospitalized COVID-19 patients. The infection was mild and less symptomatic; justifying the correlation with parameters of QoL and anxiety and depression.^{19,31} In addition psychological factors may be affected by a variety of reasons. Participants classified by

the scale with higher levels of functional limitations showed stronger correlations with HADS. These results are similar to those reported for the original version,¹² and the Spanish version.¹⁷

In the present study researchers used the paper-based forms of the PCFS_GR. Spanish researchers investigated the psychometric properties of web-based and paper-based forms.¹⁷ The percentage of agreement for the Spanish version of the PCFS scale rating between the web-based and paper-based forms was almost perfect (88% agreement when the scale was fulfilled the same day). Regardless of the form of the PCFS scale the Spanish version has showed adequate construct validity and reliability.¹⁷ Considering that an increasing number of health practitioners are using electronic resources, future studies should investigate reliability and validity of the Greek version of the PCFS scale in a web-based form.

The present study is the first study to perform a thorough cross-cultural adaptation of the PCFS into Greek, thus, making it available to clinicians and researchers working among Greek speakers. The Greek version of the scale could help health professionals to assess functional status and make treatment-based decisions on the multidisciplinary interventions for patients post COVID-19 infection.¹² This scale could help improve healthcare management and the QoL of patients post COVID-19 infection.

Participants constitute a convenient sample of Greek volunteers. In the present study, no patients with COVID-19 who have been hospitalized or required ICU admission participated, which may not be fully representative of the whole Greek post-COVID population. However, this sample might be a reliable representation of non-hospitalized COVID-19 survivors with moderate long-term functional limitations. Future studies are needed to investigate the distribution of the scale's grades across different populations (hospitalized and/or ICU patients).¹³ In addition, researchers in the present cross-sectional study did not investigate the psychometric properties of the web-based form of the scale. Future studies may investigate functional status of patients with COVID-19 via the web based form. A third limitation was that, the sensitivity to change (i.e. the ability of a questionnaire to detect clinical changes over time) was not assessed. Further studies should evaluate the responsiveness of the PCFS_GR by means of detectable changes following treatment.

In conclusion, the Greek version of the PCFS was successfully adapted into Greek and is an adequate tool to evaluate and assess functional status in patients after COVID-19. The scale can be applied in clinical rehabilitation practice and measure progress in post-COVID-19 rehabilitation and recovery. It is recommended to be used in clinical settings and research in Greek speaking populations in order to improve patient care.

List of acronyms

BMI - Body Mass Index
 EQ-5D-5L - European Quality of Life-5
 HADS - Hospital Anxiety and Depression Scale
 ICC - Intraclass correlation coefficient
 ICUs - Intensive Care Units
 PCFS - Post-COVID-19 Functional Status
 QoL - Quality of Life
 SD - Standard Deviation

Contributions of Authors

All authors have read and approved the final edited typescript.

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Conflict of Interest

The authors declare no conflicts of interests.

Ethical Publication Statement

We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

Corresponding Author

Maria Tsekoura, Department of Physiotherapy, School of Health Rehabilitation Sciences, University of Patras, Rio, Greece. Tel. 0030 2610 962414.

ORCID iD: 0000-0003-2649-0522

E-mail: mariatsekoura@upatras.gr

E-mails and ORCID iD of co-authors

Konstantinos Fousekis: kfousekis@upatras.gr

ORCID iD: 0000-0003-1451-6529

Evdokia Billis: billis@upatras.gr

ORCID iD: 0000-0002-5828-809X

Yiannis Dionyssiotis: dionyssiotis@upatras.gr

ORCID iD: 0000-0001-6962-1583

Elias Tsepis: tsepis@upatras.gr

ORCID iD: 0000-0001-9369-3261

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