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Original Research

Translation, cross-cultural adaptation and validation of the Pulmonary Rehabilitation Adapted Index of Self-efficacy (PRAISE) scale for Brazilian patients with chronic obstructive pulmonary disease

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Abstract

Background: Patients with Chronic Obstructive Pulmonary Disease (COPD) present a progressive chronic airflow obstruction. Pulmonary Rehabilitation (PR) promotes the reversal of the extrapulmonary effects of the disease and improves the quality of life. Despite the physiological benefits, the major challenge of PR is to promote change in lifestyle. In this sense, it has been emphasized the study of psychological variables such as self-efficacy. **Aim:** To translate, cross-culturally adapt and validate the PRAISE scale for Brazilian COPD patients. **Methods:** The PRAISE scale was applied on the first day by two raters and 15-20 days later by one rater. Patients were assessed for self-efficacy with the General Self-Efficacy Scale (GSS) and the COPD Self-Efficacy Scale (CSES); functional limitation for activities of daily living with the London Chest Activity of Daily Living (LCADL) scale; anxiety and depression symptoms with the Hospital Anxiety and Depression Scale (HADS); quality of life with Saint George's Respiratory Questionnaire (SGRQ); resilience with the Resilience Scale; and basic psychological needs with the Basic Psychological Needs in Exercise Scale (BPNES). The tests used were: Student's t-test or Wilcoxon's test (PRAISE score comparison); intraclass correlation coefficient (ICC), interrater reliability and test-retest and Cronbach's alpha; and Spearman's or Pearson's correlation coefficient to assess validity. **Results:** The scale was pre-tested in 10 patients to evaluate translation accuracy and cross-cultural adaptation. Thirty-four patients with COPD took part (22 men; FEV_1=42.2±15.7%pred). The interrater and test-retest ICCs were excellent (0.82 and 0.86, respectively), with no significant differences in test-retest reliability (p>0.05). Cronbach's alpha interrater and test-retest were 0.90 and 0.92, respectively (p<0.001). There were no floor and ceiling effects. The scale showed weak to moderate correlations with GSS, CSES, LCADL, HADS, SGRQ, Resilience Scale, and BPNES. **Conclusions:** The PRAISE scale proved to be valid and reliable for Brazilian patients with COPD.

Keywords: Self-efficacy; Chronic Obstructive Pulmonary Disease; Validity.

How to cite

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How can the results of this study be used in clinical practice?

- The test-retest and the inter-rater reliability and internal consistency of PRAISE are excellent.
- The PRAISE is valid and reliable to assess self-efficacy in PR in Brazilians with COPD.

Introduction

The systemic manifestations of Chronic Obstructive Pulmonary Disease (COPD) are well known and extensively documented[1]. In addition to the physical impact, patients deal with the negative consequences of psycho-emotional disorders[2]. This leads to poor adherence to healthy lifestyle habits, such as physical activity[3]. It is well established that physical inactivity contributes to the occurrence of episodes of exacerbation and increased risk of death; therefore, pulmonary rehabilitation (PR) programs combine physical training and education components, and aim to promote behavior change in patients with COPD[3,4].

There is some evidence that self-management increases knowledge and skills of patients with COPD; it also improves self-efficacy, *i.e.*, the patients' confidence in their ability to lead and manage self-care[3,5,6]. Self-efficacy influences which activities or situations the patient will perform or avoid, and facilitates the maintenance of behavioral changes acquired during PR[6-8].

In connection with physical activity, self-efficacy reflects self-confidence in engaging in, starting and sustaining a given activity[9]. Moreover, self-efficacy is considered a predictor for regular physical activity[10] and is positively correlated with greater tolerance to physical activity[11]. In this context, evaluating self-efficacy of patients with COPD in PR programs will provide better understanding of the patient's behavior towards the intervention[8].

PR staff should be able to design rehabilitation programs aiming to support patient's psychological needs by promoting pro-environmental behaviors for self-efficacy/motivational changes, intentionally designed according to the patients' baseline characteristics. The intervention approaches must include the varying self-efficacy profiles of the population[12]. The Pulmonary Rehabilitation Adapted Index of Self-Efficacy (PRAISE) scale, which assesses patients' self-efficacy in PR[13], can be pointed out as a valuable tool. The scale has valid and reliable versions available in English[13], European Portuguese[14] and Korean[15]. Recently, Liacos et al.[16] have estimated the minimal important difference (MID) of the tool between 0.5 and 1.5 points, and reported that the post-PR score had an effect size of 0.21. Also, the PRAISE baseline score was considered an independent predictor of change in sedentary behavior after PR[16].

However, to date, PRAISE has not been cross-culturally adapted and validated for use in Brazil. Given the need for a specific tool to assess self-efficacy within PR context, the aims of the present study were to translate the PRAISE scale into Brazilian Portuguese, cross-culturally adapt the version and to investigate its measurement properties in patients with COPD.

Methods

This study was approved by the Ethics Committee of the State University of Santa Catarina (CEP/UDESC) (CAEE 39702214.6.0000.0118). All participants signed the free and informed consent form. The protocol was conducted according to standardized guidelines for the translation and cross-cultural adaptation process[17] and to the Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN)[18].

Patients with COPD referred to the Center for Assistance, Teaching and Research in PR (NuReab) at the Center for Health and Sports Sciences at the Santa Catarina State University (CEFID/UDESC) were recruited. Inclusion criteria were: patients with clinical diagnosis of COPD with a spirometric classification II-IV, according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria; patients able to read self-reported questionnaires in Portuguese; clinically stable four weeks prior to the administration of the questionnaire; and no hospitalization in the past 12 weeks. The exclusion criteria were: presence of other disorders that might affect the patient´s ability to understand the questionnaire or influence the performance of one of the phases of the study; and current smoking or smoking cessation six months prior to the first study evaluation.

Translation and cross-cultural adaptation of the PRAISE scale

The first author of the original version of the scale (Ms. Emma Vincent) gave written consent for the translation and cross-cultural adaptation process. Afterwards, the scale was translated in two phases: First, the original version of the PRAISE scale was translated from English into Brazilian Portuguese by two independent translators. One of the authors compared the translations and reconciled any meaningful differences to produce and approve one version in Brazilian Portuguese. Next, the approved version was back translated by a native speaker of the English language, with proficiency in Brazilian Portuguese, and without previous involvement with the tool and the present study. The back-translation was sent to the author of the original version (Ms. Emma Vincent), who approved the Brazilian Portuguese version. Ultimately, the version of the PRAISE scale was pre-tested in 10 patients with COPD, in order to identify possible questions and misunderstandings. These patients participated only in this phase of the process. The version did not require any adaptations. Therefore, the final version of the scale translated into Brazilian Portuguese could be applied to the study sample[17].

Data collection

The final version of the PRAISE scale was administered at two moments, as an interview between rater and patient. On day 1, it was administered twice by two raters: first by rater 1 (R1) followed by rater 2 (R2-1), within a 30-minute period, with a 5 minutes tolerance. On day 2, rater 2 (R2-2) administered the scale again 15 to 20 days after day 1. The PRAISE scale is a valid and reliable tool to assess patients' self-efficacy in PR. It has 15 items, 10 from the General Self-

efficacy Scale and 5 (items 4, 7, 9, 12 and 15) that address specific challenges faced by patients in the context of PR, such as the ability to deal with exercises and with the lung disease. Each item can be scored from 1 to 4 points. The sum of the items yields the final score ranging from 15 to 60 points. Higher scores indicate higher perceived self-efficacy[13].

Self-efficacy was assessed by other two instruments. The General Self-Efficacy Scale (GSS) assesses a general sense of perceived self-efficacy[19] and consists of 10 items. The sum of the answers yields the final score that varies between 10 and 40 points. Higher scores indicate higher self-efficacy[20]. COPD Self-Efficacy Scale (CSES) measures self-efficacy of patients with COPD in managing dyspnea or avoiding breathing difficulties during certain activities. It comprehends 34 items categorized into five domains. Higher scores correspond to greater confidence in the management and control of the disease and symptoms[21].

Besides self-efficacy, other assessments were performed during the study protocol to characterize patients and to better reflect the complexity of self-efficacy. To assess lung function, spirometry was performed using the EasyOne portable spirometer. The methods and criteria followed the recommendations of ATS/ERS[22]. The predicted values were calculated based on the equations proposed by Pereira et al[23].

The Saint George's Respiratory Questionnaire (SGRQ) assesses health-related quality of life in patients with COPD[24]. The Brazilian version contains 76 items measuring three domains: Symptoms, Activities and Impacts[25]. Higher scores indicate worse quality of life and values above 10% represent impairment in quality of life[26].

The London Chest Activity of Daily Living (LCADL) scale measures limitation in activities of daily living (ADLs) in patients with COPD[27]. It has been translated into Brazilian Portuguese and validated in Brazil[28], and consists of 15 questions. Patients score from 0 to 5 for a total of 0 to 75 points. The scale can be analyzed as a percentage of the total score ($LCADL_{total}$). Higher scores represent maximal limitation to perform ADLs[28].

The Hospital Anxiety and Depression Scale (HADS) evaluates the presence of symptoms of anxiety and depression. It comprises 14 multiple choice questions, divided into two subscales[29]. Scores ≥8 indicate significant clinical symptoms for anxiety. Scores ≥5 specifies significant clinical symptoms of depression[30].

The Basic Psychological Needs in Exercise Scale (BPNES) evaluates the patients' perceptions of meeting basic psychological needs as well as their satisfaction with exercise. It consists of 11 items divided into three domains: Autonomy, Relatedness and Competence[31].

The Resilience Scale measures levels of positive psychosocial adaptation to important life events. It has been validated for the Brazilian population[32]. Given a range of 25 and 175 points, scores up to 125 represent low resilience; between 125 and 145 a moderate resilience; and above 145 a high resilience[12].

Data analysis

The data were processed in the SPSS version 20.0 program and presented as mean, standard deviation and 95% confidence interval or median and interquartile range. The normality of the data was verified by the Shapiro Wilk test and the level of statistical significance was 5%. The Student's *t*-test for paired samples or Wilcoxon's test was used to compare scores at the PRAISE inter-rater scale and test-retest. The intraclass correlation coefficient was used to assess the reliability of the PRAISE scale (interrater reproducibility and test-retest), and the Cronbach's alpha to measure internal consistency. The Bland-Altman plot was used to analyze the agreement between the scale applications. The validity of the PRAISE scale was assessed by the Spearman's or Pearson's correlation coefficient, using GSS, CSES, SGRQ, BPNES, LCADL, HADS and the Resilience Scale.

The sample size estimation was based on two assumptions: I) expected effect sizes of ICC, Cronbach's alpha and correlation coefficient; and II) COSMIN recommendation of at least 30 participants in order to be considered a fair sample size. It was considered for the estimations: a two-tailed significance level of 0.05, a power of 90% and a dropout rate of 20%. Considering 0.70 as the minimum acceptable ICC, the estimated sample size was 19 patients. For a minimum acceptable Cronbach's alpha of 0.70 the estimated sample size was 29 patients. At last, considering an expected correlation coefficient of at least 0.50, the estimated sample size was 34 patients. The estimation that attended COSMIN recommendation with the highest sample size was used in this study.

Results

Thirty-eight patients were included in the study and four of them were excluded: two patients had cognitive impairment, one patient had other associated lung diseases, and one patient showed FEV_1/FVC ratio >0.7 in spirometry. Thus, 34 COPD patients (22 men, 64.7%) completed the study protocol, and their characteristics are described in table 1. Eight patients (23.5%) were classified as GOLD II, 19 (55.9%) as GOLD III, and 7 (20.6%) as GOLD IV.

The median difference (interquartile range) in the PRAISE inter-rater score was 0.00 (3.00 to -2.00) and in the test-retest score was 0.00 (2.00 to -2.25). There were no significant differences when comparing the scores of the PRAISE scale in the test-retest analysis (p>0.05). Floor (15 points) and ceiling effects (60 points) were not observed in any of the three evaluations of the PRAISE scale (Table 2). The minimum time to administer the scale was two minutes and the maximum was nine minutes.

Reliability

High internal consistency and high reproducibility of the total score of the PRAISE scale were observed in all assessments of the study. Inter-rater Cronbach's alpha of the

PRAISE scale was 0.90. Cronbach's alpha coefficient for the PRAISE items ranged from 0.60 to 0.86 in the analysis of the inter-rater internal consistency. In the inter-rater reliability analysis, the overall ICC was 0.82 (95%CI 0.67-0.91, p<0.01) and the ICC of the items ranged from 0.43 to 0.76. The reliability of the items was moderate in all items, except for item 15, which showed high reliability.

Table 1. Sample characteristics.

Variable	Mean ± Standard Deviation
Age, years	68.1 ± 7.49
Body Mass, Kg	67.5 ± 17.4
Height, m	1.65 ± 0.11
BMI, Kg/m^2	24.5 ± 4.63
FEV_1/FVC	0.48 ± 0.11
FEV_1, L	1.23 ± 0.55
FEV_1, %pred	42.2 ± 15.7
FVC, L*	2.22 (1.99-2.97)
FVC, %pred	68.0 ± 17.7
LCADL Total*	16.0 (13.0-21.2)
LCADL, %Total*	26.0 (22.6-30.9)
SGRQ, Symptoms	29.9 ± 20.7
SGRQ, Activities	57.7 ± 19.1
SGRQ, Impacts*	20.4 (12.0-34.9)
SGRQ, Total*	35.7 (21.5-40.5)
HADS, Anxiety	5.68 ± 4.21
HADS, Depression	4.21 ± 3.07
HADS, Total*	9.00 (5.75-13.0)
Resilience Scale	141.1 ± 14.1
BPNES, Autonomy	13.3 ± 3.82
BPNES, Competence	14.2 ± 3.67
BPNES, Relatedness	12.3 ± 2.98

Data presented as mean ± standard deviation except where indicated; *: median (interquartile range); F: female; M: male; Kg: kilogram; m: meters; BMI: body mass index; FEV_1: forced expiratory volume in the first second; FVC: forced vital capacity; L: liter; % pred: percentage of the predicted value; LCADL: Activity of Daily Living scale; SGRQ: Saint George's Respiratory Questionnaire; HADS: Hospital Anxiety and Depression Scale; BPNES: Basic Psychological Needs in Exercise Scale.

Test-retest internal consistency of the PRAISE scale was 0.92. Items' Cronbach's alpha coefficient ranged from 0.28 to 0.89. In the analysis of test-retest reliability, the PRAISE scale ICC was 0.86 (95%CI 0.73-0.93, p<0.01) and the ICC of the items ranged from 0.34 to 0.80. The reliability of items 2 and 8 were not statistically significant (p>0.05). The reliability was low in items 7 and 12; moderate in items 1, 3, 4, 6, 9, 10, 11, 13 and 15; and high in item 14. The standard error of measurement was 2.43 and the minimum detectable difference was 6.73 points.

Figure 1 shows the inter-rater and test-retest agreement between administrations of the scale. The mean difference between applications was very close to zero and the vast majority of patients were concentrated close to the average of the differences. In addition, it can be seen that no patient scored less than 30 points in the individual mean of the scale's applications.

Validity

The score obtained at the PRAISE scale showed a moderate correlation with the score obtained at GSS (r=0.67; p<0.05) and a weak correlation with the CSES (r=0.34; p<0.05) (Figure 2).

PRAISE also showed weak correlations with the Autonomy and Competence domains of the BPNES scale and with the $LCADL\%_{total}$ scale, as well as to moderate correlations with the Resilience Scale, HADS and SGRQ (Figure 3). Other correlations that varied from weak to moderate were observed between the PRAISE scale and the $LCADL_{Physical\ Activities}$ scale (r=-0.36; p=0.03); $LCADL_{Leisure\ Activities}$ (r=-0.43; p=0.01); $SGRQ_{Impacts}$ (r=-0.44; p<0.01); $HADS_{Anxiety}$ (r=-0.35; p=0.04); $HADS_{Depression}$ (r=-0.45; p<0.01); $CSES_{Negative\ Affect}$ (r=0.39; p=0.02). There were no correlations between the PRAISE score and the other studied variables.

Discussion

The PRAISE scale showed, in the present study, excellent reliability and internal consistency. It is noteworthy that this result is in line with previous data from the original version of the scale, which showed reproducibility of 0.72 (95%CI, 2.27-0.82), and internal consistency of 0.95[13]. In the present study, the PRAISE scale did not have any floor nor ceiling effects. This is an important finding, as these effects may interfere

Table 2. Total score, minimum and maximum score values, and application time for the PRAISE scale.

	R1	R2-1	R2-2
Score	49 (43-54)	51 (42-53)	49 (44-54)
Minimum Score	33	34	31
Maximum Score	56	58	57
Time, minutes	4.00 (3.12-5.00)	2.88 (2.62-3.90)	3.13 (2.75-4.00)

Data presented as median (interquartile range); R1: rater 1, assessment 1; R2-1: rater 2, assessment 1; R2-2: rater 2, assessment 2.

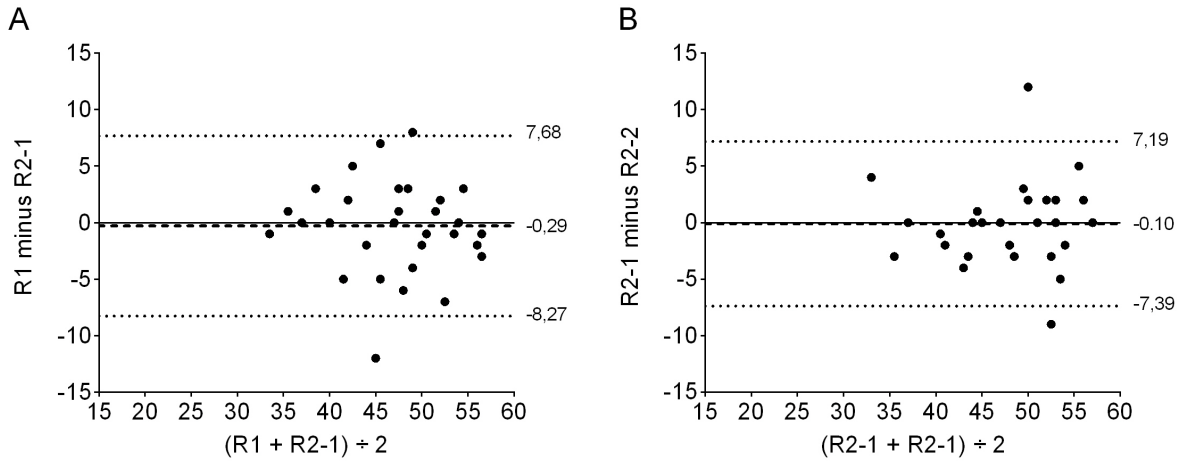

Figure 1. Bland-Altman plots analyzing the agreement between the applications of the PRAISE scale. A: inter-rater agreement. B: test-retest agreement. Hatched line: average of the differences; Dotted lines: upper and lower agreement limits (2 standard deviations); R1: rater 1 on day 1; R2-1: rater 2 on day 1; R2-2; rater 2 on day 2).

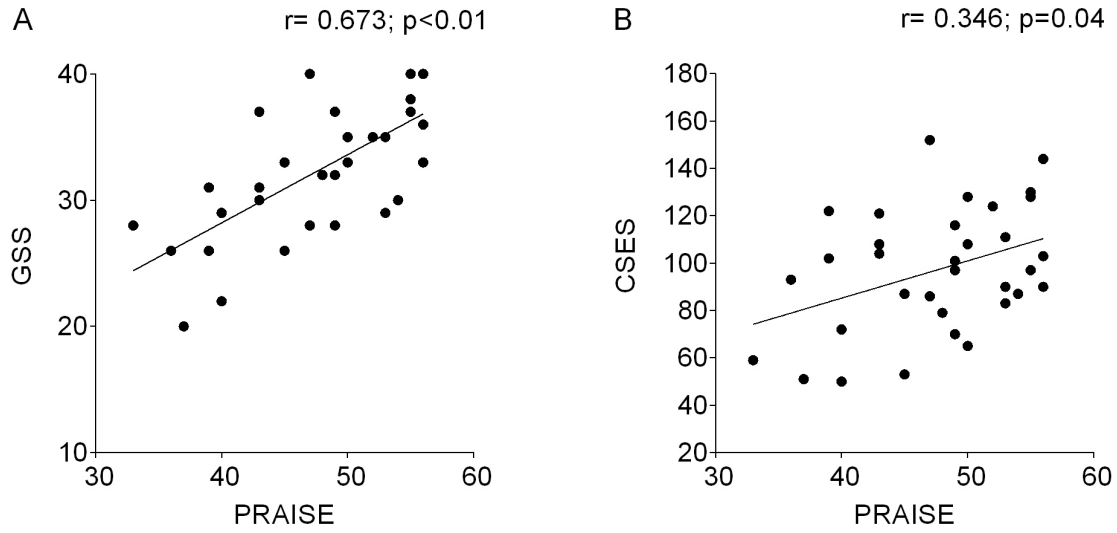

Figure 2. Correlation between PRAISE and (A) General Self-Efficacy Scale (GSS) and (B) COPD Self-Efficacy Scale (CSES).

with change detection, *i.e.*, improvement or worsening, over a period of time or even after an intervention.

The validity was demonstrated through the significant correlations between the score of the Brazilian version of the PRAISE scale with the scores of GSS (r=0.67; p<0.01) and CSES (r=0.35; p<0.04), since both assess general and specific self-efficacy, respectively. The correlation with GSS was expected, since 10 items of the PRAISE scale come from GSS, and therefore, these questions are very similar to each other[13]. Conversely, CSES provides items with sufficient complexity in relation to specific situations of trust and disease management in patients with COPD[9]. PRAISE, in turn, addresses PR-related issues[13] and complements the self-efficacy assessment of patients with COPD. Besides, it is established in the SCT that self-efficacy should be addressed in a very specific way rather than in general. So, using both scales is worth consideration, as they make the assessment more comprehensive and robust.

In this study, the association of PRAISE with the Resilience Scale was moderate (r=0.53; p<0.01). The assessment of resilience has been incorporated into the studies given its effects on health behavior and its influence on COPD patients' ability to manage the disease[32,33].

The association of the scores of the PRAISE scale with the scores of symptoms of anxiety and depression was similar to the scores found in the original study of the scale (r=-0.36; p<0.001; r=-0.37; p<0.001, respectively). Also, other studies have already demonstrated that increasing self-efficacy in patients with COPD is associated with fewer symptoms of anxiety and depression[34-36].

PRAISE also showed a correlation with quality of life in the present study, which had been previously demonstrated[37]. Self-efficacy is an important construct in self-management and seems to contribute to health behavior and disease control[6,38].

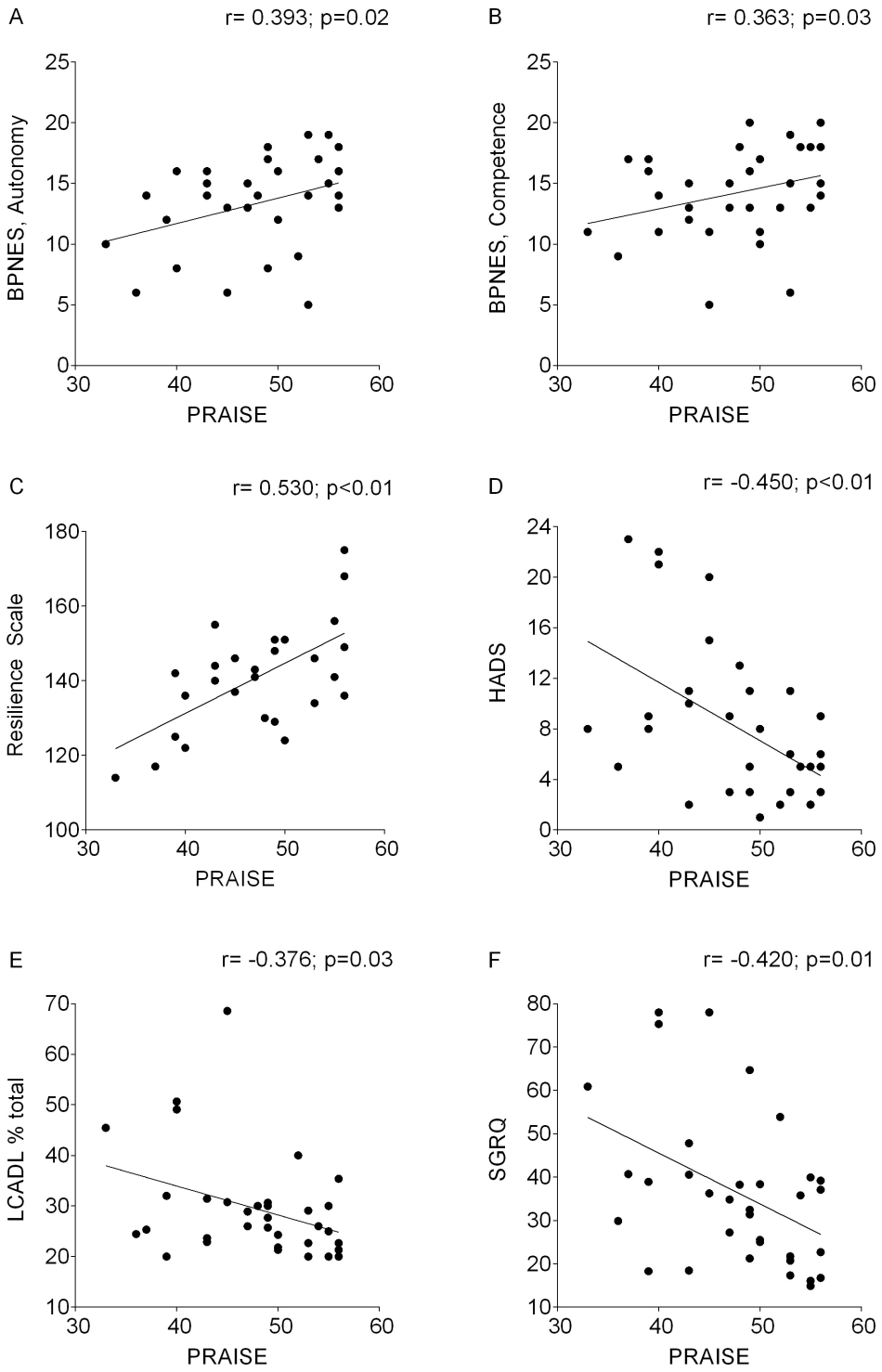

Figure 3. Correlation between PRAISE and (A) domain Autonomy of the Basic Psychological Needs in Exercise Scale ($BPNES_{Autonomy}$); (B) domain Competence of the Basic Psychological Needs in Exercise Scale ($BPNES_{Competence}$); (C) Resilience Scale; (D) total of Hospital Anxiety and Depression Scale ($HADS_{total}$); (E) total of London Chest Activity of Daily Living ($LCADL\%_{total}$); (F) total of Saint George's Respiratory Questionnaire (SGRQ).

Regarding the Autonomy and Competence domains of the BPNES, studies have reported a positive association of fulfillment of basic psychological needs, motivation, self-efficacy and maintenance of behavior with better health outcomes[37], such as adherence and maintenance of physical activity programs[38]. They are seen as necessary nutrients for psychological health that individuals try to satisfy, and their satisfaction can affect many psychological factors, including self-efficacy[38,39].

Ultimately, PRAISE was related to the functional limitation in activities of daily living. A similar result was demonstrated in a study that pointed out that the baseline score

of the scale was predictive of changes in sedentary time after PR[16]. The association of the PRAISE score with functional status variables is important, as the scale can be used as a tool to identify patients who are more likely to improve the level of physical activity after PR.

The self-efficacy assessment should be used to consider people's needs and adapt PR to their needs[40]. Thus, self-efficacy can be better evaluated and understood with the PRAISE scale. This outcome has become more evident as a possible contribution and an opportunity to fill an important gap in PR. This is related to the process of behavior changes of patients and aims to ensure maintenance of physical activity and subsequent benefits of PR in the long run[8]. PR needs to be able to promote improvement in physical aspects as well as behavioral change in patients. Accordingly, one single approach cannot be applied to everyone. Protocols should consider the profile of self-efficacy and motivation of each patient, since personal factors create positive learning experiences, which will eventually improve self-efficacy[8,12,40].

Despite the relevant findings of this study, the interpretability of the PRAISE scale still needs to improve. Even knowing that higher scores represent greater self-efficacy, so far there is no cutoff point, which is something important to be established. The present study did not evaluate responsiveness and minimum important difference. So, further studies are needed to investigate the ability of the Brazilian Portuguese version of the PRAISE scale to detect changes after PR and improve its response-to-intervention interpretation. In addition, the present study did not include patients with the less severe stage of COPD (GOLD stage I), compromising the extrapolation of the previous findings for those patients.

The PRAISE scale proved to be valid and reliable for assessing self-efficacy in patients with COPD in Brazil. Furthermore, self-efficacy correlated with other affective-cognitive outcomes such as resilience, symptoms of anxiety and depression, and the basic psychological needs of autonomy and competence, besides quality of life. Our findings make a significant contribution to clinical practice and research, as they enable the assessment of self-efficacy and facilitate the development of specific strategies in PR. Further research is necessary to establish the other measurement properties of the PRAISE.

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Conflict of interest

None.

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Author contribuitions

All authors contributed to the drafting of the manuscript. M.K, T.S.M, and A.F.M contributed to the study design and protocol. M.K., S.G.G., H.F.A. contributed to the data acquisition process.M.K, S.G.G., T.S.M and A.F.M contributed to the data analysis and statistical support. M.K, T.S.M and A.F.M contributed to the critical revision of the manuscript. A.F.M. is the guarantor of the paper, taking responsibility for the integrity of the work as a whole, from inception to the published article.

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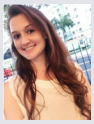

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