

## ORIGINAL ARTICLE

# Validity and reliability of the Turkish version of the COPD exercise self-regulatory efficacy scale

Kevser Sevgi Ünal Aslan<sup>1</sup>  | Funda Çetinkaya<sup>2</sup>

<sup>1</sup>Fundamentals of Nursing Department, Osmaniye School of Health, Korkut Ata University, Osmaniye, Turkey

<sup>2</sup>School of Health, Nursing Department, Aksaray University, Aksaray, Turkey

**Correspondence**

Kevser Sevgi Ünal Aslan, Fundamentals of Nursing Department, Osmaniye School of Health, Korkut Ata University, Osmaniye 8000, Turkey.

Email: kevser-sevgi@hotmail.com

**Abstract**

**Introduction:** The concept of self-efficacy in chronic obstructive pulmonary disease (COPD) and the development of self-efficacy in individuals are extremely significant. Increasing the self-efficacy level in individuals with COPD will contribute to the effective management of symptoms. Moreover, exercise is essential in COPD management and nursing care.

**Objectives:** This study aimed to evaluate the results of the validity and reliability study of the Turkish version of the COPD Exercise Self-Regulatory Efficacy Scale (Ex-SRES) developed by Davis et al.

**Methods:** This is a methodological study conducted with 160 patients diagnosed with COPD. Data were collected using the Personal Information Form and COPD Ex-SRES. Moreover, the Cronbach's  $\alpha$  value was calculated, and the test-retest reliability was performed for reliability analysis.

**Results:** The item total correlation scores of the Turkish version were between 0.608 and 0.853 points. The total score correlation coefficients of all the items in the scale were over 0.30. In this respect, the item total correlation values of the Turkish version of the Ex-SRES were at an appropriate level of reliability. In addition, the total Cronbach's  $\alpha$  coefficient of the scale was calculated as 0.96.

**Conclusion:** The Turkish version of the Ex-SRES was found to have high validity and reliability and to be a precise tool that specifically measures exercise self-efficacy in the COPD patient group.

**KEYWORDS**

COPD, exercise, self-efficacy

## 1 | INTRODUCTION

Self-efficacy is defined as “individual's own judgment about his/her capacity to succeed by organising the activities necessary to show a certain performance”.<sup>1</sup> The “Health Promotion Model”, which has been discussed in Turkey in recent years, was developed by Pender based on Bandura's social learning theory. This model describes and defines health-promoting factors and predicted causal mechanisms.<sup>2</sup> According to this model, an individual's self-efficacy perception is a significant

determinant in initiating and maintaining health-promoting behaviours. The self-efficacy theory suggests two types of expectancy, that is, outcome and self-efficacy expectancies, which affect behaviour. Outcome expectancy means that certain behaviours will cause certain outcomes, whereas self-efficacy expectancy refers to one's belief in the ability to perform the behaviour necessary to achieve an outcome. In this respect, self-efficacy perception plays a significant role in determining the activities that the individual will do or avoid from. Individuals with high levels of self-efficacy manage

their diseases and treatment better. The high level of self-efficacy may reduce the emotional distress of the disease on the individual and increase the quality of life.<sup>1,2</sup> Self-efficacy, which is a significant determinant in initiating and maintaining a positive health behaviour, is an essential component of health promotion behaviour in chronic diseases such as chronic obstructive pulmonary disease (COPD), asthma and diabetes. Since COPD is a chronic disease that causes severe respiratory distress, patients with COPD lack confidence in their ability to perform certain activities to avoid breathing difficulties. This lack of self-confidence is defined as low self-efficacy. Although patients with COPD are physically sufficient to perform the activity, they avoid the routine activities of daily life as a result of low self-efficacy.<sup>3</sup> In particular, individuals with COPD may develop low self-efficacy expectancy for their ability to manage or avoid breathing difficulties when performing certain activities. Low self-efficacy causes activity limitation in patients with COPD. By individual care, the frequency and severity of COPD attacks can be reduced; whereas the quality of life and exercise tolerance can be increased.<sup>4</sup> Increased dyspnea during exercise in patients with COPD reduces their exercise capacity. This situation causes patients to avoid exercise and thus leads to decreased mobility capacity compared with their peers. The ability of patients with COPD to define their low self-efficacy themselves is extremely significant for nurses to create individual care interventions to increase their self-efficacy.<sup>3,4</sup> Therefore, self-efficacy is a measurable tool between chronic respiratory disease and unnecessary activity limitation. Despite the existence of tools to measure the exercise capacity of patients with COPD, there are no scales that can measure the self-exercise capacity of the individual outside the clinic. Because of the frequent nonclinical follow-up and long and challenging treatment of people diagnosed with COPD, patients should measure their own exercise capacity. Since physical activity is essential in the treatment of patients with COPD and low physical activity is a sign of a further disease, monitoring the physical activity capacity of the patients and encouraging such activity are necessary for the prevention of rehospitalization. Davis et al developed the Exercise Self-Regulatory Efficacy Scale (Ex-SRES) to assess the exercise capacity of individuals diagnosed with COPD.<sup>5</sup> This was originally developed in English in Thailand and has also been tested for reliability in Chinese.<sup>6</sup> This study was conducted to evaluate the validity and reliability of the Turkish version of the Exercise Self-Regulatory Efficacy Scale (Ex-SRES) developed by Davis et al.<sup>5</sup>

## 2 | MATERIALS AND METHODS

### 2.1 | Design

This study used a descriptive and methodological design.

### 2.2 | Study participants

This study was conducted in inpatients diagnosed with COPD in the chest diseases clinic of a 400-bed training and research hospital between April and July 2018. The inclusion criteria were the following: the patient should be 18 years or older, should volunteer to participate in the study, should be able to communicate in Turkish, should not have any psychiatric disease or cognitive impairment and should not have any mental disability or any other diseases such as the presence of musculoskeletal deformity and uncontrolled severe heart disease (heart failure, uncontrollable hypertension, angina or myocardial infarction and heart valve problems) that prevent the patient from exercising. After the individuals agreed to participate in the study, the Mini-Mental State Examination was performed to verify their comprehension skills. Furthermore, the spirometry test was conducted to confirm the presence of respiratory tract obstruction and dyspnea. Patients with airway obstruction were not included in the study. Data were collected from 160 patients who met the sampling criteria between the data collection dates.

### 2.3 | Data collection tools

The “Personal Information Form”, which consisted of 14 questions about age, gender, marital status, smoking status and COPD, and “Ex-SRES” were used as the data collection tools.

*Ex-SRES*: This scale, which consisted of 16 items, was developed by Davis et al<sup>5</sup> in 2007 for the self-assessment of the exercise capacity of individuals diagnosed with COPD. This requires patients to indicate the degree of their self-confidence to continue exercising regularly (3 times a week for 20 min). Each question is evaluated by a 3-point Likert scale: 1 I do not trust myself at all; 2, I have a moderate level of trust in myself; and 3, I quite trust myself. Furthermore, the Cronbach's  $\alpha$  value is 0.917.<sup>5</sup>

### 2.4 | Data collection

Data were collected by the researcher in the patient rooms by a face-to-face interview technique. Individuals who participated in the study answered the questions in the Ex-SRES in approximately 15 minutes. The application of the questionnaire forms took 20 minutes on average.

### 2.5 | Data analysis

Statistical Package for the Social Sciences for Windows and Analysis of Moment Structures ready statistical package programs were used for coding and statistical analysis of data.

**TABLE 1** Sociodemographic characteristics of participants

Characteristics		
Age (mean $\pm$ SD)	64.48 $\pm$ 12.92	
	N	(%)
<i>Gender</i>		
Female	74	46.3
Male	86	53.8
<i>Marital status</i>		
Married	113	70.6
Single	47	29.4
<i>Education status</i>		
Not literate	56	35.0
Primary education	80	50.0
High school	22	13.8
University	2	1.3
<i>Occupation</i>		
Officer	21	13.1
Worker	31	19.4
Self-employed	28	17.5
Retired	16	10.0
Housewife	64	40.0
<i>Who do you live with</i>		
Alone	33	20.6
With mother and father	1	0.6
With my wife and children	84	52.5
Other	42	26.2
<i>Smoking</i>		
I have never used	88	55.0
I am using	23	14.4
I stopped using	49	30.6
<i>House heating type</i>		
Stove	87	54.4
Heater	73	45.6
<i>Any other chronic disease than COPD</i>		
Yes	73	45.6
No	87	54.4
<i>Another chronic illness</i>		
Diabetes	46	28.8
Osteoporosis	3	1.9
Heart disease	16	10.0
Hypertension	19	11.9
Sleep apnea	4	2.5
<i>Application to the hospital for the last year</i>		
I have never been to a hospital for the last year	39	24.4
1 or 2 times	56	35.0

(Continues)

**TABLE 1** (Continued)

Characteristics		
3 or more times	65	40.6
<i>Do you regularly check for COPD?</i>		
Yes	105	65.6
No	29	18.1
Partially	26	16.3

Moreover, for the validity and reliability of the scale, the Pearson correlation technique was used to determine the item total score correlation of exploratory and confirmatory factor analyses, and the internal consistency of the scale was measured using the Cronbach's reliability coefficient analysis. Prior to factor analysis, the Kaiser-Meyer-Olkin (KMO) and Bartlett's tests were applied to determine the sampling adequacy and factor analysis.

### 3 | RESULTS

#### 3.1 | Content validity

The Ex-SRES, developed originally in the English language, was translated into Turkish and English by a linguist who speaks English and Turkish well. The Turkish version of the scale was translated back into English. After the translation, two nurses evaluated the Turkish version separately in terms of intelligibility and cultural characteristics, and they reached a consensus in terms of word choice and cultural characteristics in the Turkish version. Finally, the Turkish language used in the scale was checked by a Turkish language expert. Before the start of the validity and reliability studies, the linguistic equivalence study was conducted to determine the consistency between the Turkish version and original Ex-SRES. To determine the intelligibility, the study was applied to 15 patients not included in the study sample. In the preliminary application, it was determined that the scale's expressions were understandable.

The results of the introductory characteristics of patients are presented in Table 1.

#### 3.2 | Internal consistency

The item total correlation scores, factor loads and  $\alpha$  value of the scale are presented in Table 2. The item total correlation scores of the Turkish version of the Ex-SRES were between 0.608 and 0.853 points. The total score correlation coefficients of all the items in the scale were over 0.30. Therefore, the item total correlation values of the Turkish version of the COPD Ex-SRES were at the appropriate level of reliability.

**TABLE 2** Item total correlations of the scale

Items	Scale mean if item deleted	Scale variance if item deleted	Corrected item total correlation	Squared multiple correlation	Cronbach $\alpha$ if item deleted
(Ex-Sres)1	437.2375	74 595.365	0.731	0.709	0.967
(Ex-Sres)2	437.9250	73 000.850	0.852	0.800	0.965
(Ex-Sres)3	434.0500	72 951.444	0.787	0.793	0.966
(Ex-Sres)4	434.0250	73 223.245	0.784	0.736	0.966
(Ex-Sres)5	434.0500	72 284.274	0.787	0.797	0.966
(Ex-Sres)6	433.9875	72 418.742	0.871	0.831	0.965
(Ex-Sres)7	435.3625	73 462.157	0.796	0.809	0.966
(Ex-Sres)8	435.0500	73 138.765	0.766	0.734	0.966
(Ex-Sres)9	438.5375	72 770.552	0.817	0.776	0.966
(Ex-Sres)10	443.9250	74 050.057	0.779	0.700	0.966
(Ex-Sres)11	444.8000	72 244.891	0.851	0.903	0.965
(Ex-Sres)12	445.9250	72 622.686	0.853	0.881	0.965
(Ex-Sres)13	444.4125	72 697.011	0.867	0.863	0.965
(Ex-Sres)14	430.6750	73 706.611	0.608	0.582	0.970
(Ex-Sres)15	443.4250	72 917.655	0.760	0.791	0.966
(Ex-Sres)16	440.8000	71 706.174	0.870	0.806	0.965

In addition, the total Cronbach's  $\alpha$  coefficient of the scale was calculated as 0.96.

### 3.3 | Exploratory factor analysis

To assess sampling adequacy and suitability with the factor analysis prior to factor analysis, the KMO and Bartlett's tests were applied. The KMO value was found to be 0.944, which indicates the suitability for the analysis of the principal components. Similarly, Bartlett's test results ( $\chi^2$ , 2920.25;  $P = 0.000$ ) indicate that the data are interrelated and suitable for factor analysis.

It was determined that the single-factor structure of the Turkish version of the Ex-SRES was confirmed as a result of the analyses and the factor loads were distributed between 0.58 and 0.90 (Table 3). As a result of the test-retest analysis of the scale, a positive correlation was found between the first and second applications of the scale at  $r = 0.995$  ( $P < 0.001$ ).

As presented in Table 4, the CFA result shows that the Ex-SRES fits well with the values expected.

As presented in Figure 1, CFA of the COPD Exercise Self-Regulatory Efficacy Scale (Ex-SRES).

## 4 | DISCUSSION

All symptoms in COPD, especially dyspnea and the fact that the disease is a chronic disease and the requirement of a

**TABLE 3** Factor structure, exploratory variance values and eigenvalues of the scale

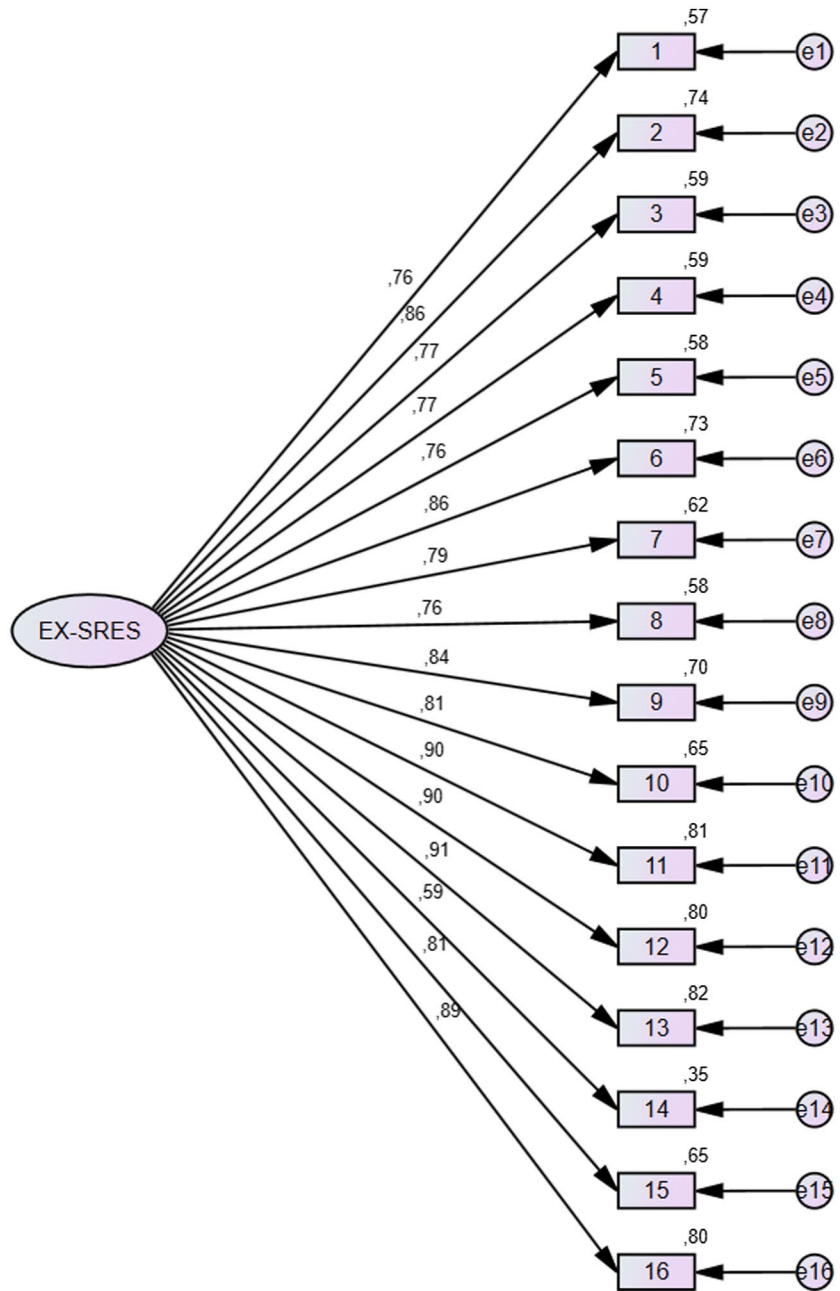
Scale items	Factors loading
1. If the weather is bothering me	0.758
2. If I feel aches and pains while exercising	0.861
3. If I have to exercise alone	0.766
4. If I feel exercising is not fun or enjoyable	0.766
5. If I feel self-conscious about my appearance when I exercise	0.763
6. If have no support from other(s)	0.856
7. If I am too busy with other activities or having schedule conflicts	0.790
8. If I am on vacation or away from home	0.765
9. If I have difficulty getting to the location for exercise	0.835
10. If I feel stressed	0.808
11. If I feel sick or am ill	0.899
12. If I feel short of breath when exercising	0.896
13. If I feel tired or fatigued	0.907
14. If I am worried about money	0.589
15. If I need to use oxygen	0.805
16. If I do not feel like it (exercising)	0.892
Total variance	66.186%

long-term care, restricts the patient's life and affects his/her self-care strength and self-efficacy level.<sup>7,8</sup> The low level of self-efficacy in patients with COPD causes activity limitation.<sup>3,8</sup> Thus, the level of self-efficacy should be assessed to

**TABLE 4** Ex-SRES CFA goodness-of-fit values

Variable	$\chi^2$	df	CMIN/df	GFI	CFI	TLI	RMSEA
Ex-SRES	123.457	62	1.991	0.912	0.979	0.95	0.072

**FIGURE 1** CFA of the COPD Exercise Self-Regulatory Efficacy Scale (Ex-SRES)



ensure the management of COPD, meet the self-care needs of patients, and increase their self-efficacy. This study aimed to evaluate the psychometric properties of the Turkish version of the Ex-SRES in patients with COPD.

The validity and reliability studies of the Ex-SRES were conducted in accordance with the principles determined in the literature.<sup>9,12</sup> First, language equivalence was performed in the study. Three methods are used to translate an original scale into a targeted language, namely “one-way translation”, “study group translation” and “back translation”.

Among these, the back translation method is often used to ensure the cultural equality of the scale. The translators of the scale should be selected from those who speak both languages fluently and know both cultures very well.<sup>9,10</sup> In this study, the back translation method was used, and the scale was translated in accordance with the literature by the expert researchers who knew both languages and the properties of both cultures. Furthermore, the language validity of the scale was approved in accordance with the opinions of the experts. The intelligibility of the expressions in the

scale was tested with the pre-application. The scale was finalized according to the recommendations of the experts, and the results of the pre-application evaluation. According to experts' opinions, the Turkish version of the Ex-SRES is an appropriate measurement tool in terms of language and content.

The KMO test and Bartlett's sphericity analysis were performed to evaluate the sampling adequacy. The sampling adequacy and KMO values were taken into account when performing factor analysis.<sup>13</sup> A good factor analysis requires the KMO value to be  $\geq 0.70$ .<sup>14</sup> In this study, the KMO and Bartlett's sphericity test results were found to be 0.944 and  $\chi^2 = 2920.25$ , respectively, and both tests were found to be significant (significance level,  $P < 0.001$ ). This result shows that the sample size is appropriate for factor analysis. In the Chinese version developed by Tsai et al, the KMO test result was found to be 0.90, and the significance level was  $P < 0.0001$ .<sup>6</sup> The value of the KMO test in this study is similar to the previous validity analysis. Item analysis refers to the relationship between the value of each item in the measurement tool and the total value taken from the entire measurement tool. If the items in the measurement tool are of equal weight and in the form of independent units, the relationship between each item value and total values is expected to be high.<sup>15</sup> A high correlation coefficient obtained for each item of the scale indicates that the items are more effective and sufficient to measure the targeted behaviour.<sup>14,16</sup> The item correlation coefficient below 0.25 indicates the lack of reliability.<sup>15</sup> The item total correlation scores of the Turkish version of the Ex-SRES were between 0.608 and 0.870 points (Table 2). The total score correlation coefficients of all items in the scale were over 0.250. In this respect, the item total correlation values of the Turkish version of the Ex-SRES are at an appropriate level of reliability. The item correlation scores of the original scale developed by Davis et al were found to be between 0.39 and 0.74 points,<sup>5</sup> whereas those of the version developed by Tsai et al were found to be between 0.40 and 0.79.<sup>6</sup>

Another criterion for testing the validity is construct validity. To determine the construct validity of the Ex-SRES, factor analysis was performed on the total data. As a result of the analyses, a construct consisting of one factor with a total variance of 66.186% was obtained.

The finding that the Ex-SRES represents a single factor is consistent with the original scale finding. The evaluation of the Ex-SRES in terms of the fit index led to the finding that the model was in good fit. It has been found that the original factor structure of the scale matches with the factor structure of the Turkish version. The Cronbach's reliability coefficient was examined as an indicator of the internal consistency and homogeneity of the Ex-SRES. For the internal consistency of the scale, a Cronbach's  $\alpha$  coefficient of  $>0.70$  is recommended in the literature.<sup>17</sup> The great

coefficient values in the scale indicate that the scale items are consistent with each other. In this study, the Cronbach's  $\alpha$  coefficient was calculated as 0.96. Such coefficient of the original scale was found to be 0.91. In addition, in the study conducted by Tsai et al, the Cronbach's  $\alpha$  coefficient was calculated as 0.92. The findings of the present study, which are consistent with the findings of the previous studies, indicate that the scale is highly reliable with internal consistency.

To determine the extent to which the scale provided time-based stable measurements, the test-retest reliability of the scale was examined. According to the results of the test-retest analysis, a positive and significant relationship was found between the first and second applications of the Turkish version of the Ex-SRES at  $r = 0.995$  ( $P < 0.0001$ ) level. This finding demonstrates that the scale can be used reliably.<sup>9,11,18</sup>

## 5 | CONCLUSIONS

The results of this study indicate that the Turkish version of the Ex-SRES has a good internal consistency and proves content and construct validity. Therefore, the Turkish version of the Ex-SRES in a clinical setting may be useful to measure exercise self-efficacy in patients with COPD.

### ACKNOWLEDGEMENTS

We would like to thank all COPD patients who agreed to participate in the study. This study was not supported by any research fund.

### CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest with the contents of the article.

### AUTHOR CONTRIBUTIONS

All the authors read and approved the final manuscript.

*Data collection, data analysis, and prepared the manuscript:*

Ünal Aslan, Çetinkaya

*Supervised the analysis and research process:* Ünal Aslan

## ETHICS

To start the study, we received written permission from Davis Amy HT, one of the researchers who developed the scale, via e-mail. Prior to the research, ethics committee approval was received from Aksaray University Ethics Committee (protocol no: 2018/74), and written permission was obtained from the institution to conduct the research. Moreover, the study participants were informed about the research, and their consents were obtained.

**ORCID**

Kevser Sevgi Ünal Aslan  <https://orcid.org/0000-0002-5263-4465>

**REFERENCES**

1. Bandura A. *Self-Efficacy: The Exercise of Control*. New York, NY: Freeman; 1997.
2. Bandura A, ed. *Social Learning Theory*. Upper Saddle River, NJ: Prentice Hall; 1977.
3. Kara M, Mirici A. Validity and reliability of koah self-effectiveness scale Turkish version. *AÜTD*. 2002;34:61-66.
4. Ünal KS, Tar Kant E, Çetinkaya F. Oxygen saturation of walking exercise in patients with COPD. Effect on dyspnea and happiness level. *J Curr Res Health Sect*. 2018;8(1):95-110.
5. Davis AHT, Figueredo AJ, Bonnie Fahy F, Rawiworrakul T. Reliability and validity of the Exercise Self-Regulatory Efficacy Scale for individuals with chronic obstructive pulmonary disease. *Heart Lung*. 2007;36:205-216.
6. Tsai YH, Chen JL, Davis AHT, et al. Development of the Chinese-version of the exercise self-regulatory efficacy scale for patients with chronic obstructive pulmonary disease. *Heart Lung*. 2018;47:16-23.
7. Bal Özkaptan B, Kapucu S. The importance of home care in the development of self-efficacy in individuals with COPD. *Cumhuriyet Hemşirelik J*. 2015;4(2):74-80.
8. Desveaux L, Harrison SL, Gagnon JF, Goldstein RS, Brooks D, Pepin V. Effects of exercise training on cognition in chronic obstructive pulmonary disease: a systematic review. *Respir Med*. 2018;139:110-116.
9. Aksayan S, Gozüm S. A guide for transcultural adaptation of the scale. *J Nurs Res Dev*. 2002;4(1):9-14.
10. Gözüm S, Aksayan S. Guideline II for Intercultural Scale Adaptation: Psychometric Properties and Intercultural Comparison. *Journal Hemşirelik Araştırma Geliştirme*. 2005;4:9-20.
11. Erefe İ. The nature of data collection tools. In: Erefe İ, ed. *Principles and Methods of Research in Nursing*. Istanbul, Turkey: Odak Ofset, 2002:169-187.
12. Acquadro C, Conway K, Hareendran A, Aaronson N. Literature review of methods to translate health-related quality of life questionnaires for use in multinational clinical trials. *Value Health*. 2008;11(3):509-521.
13. Cokluk Ö, Sekercioglu G, Büyükoztürk S. Multivariate statistics SPSS and LISREL applications for social sciences. Ankara, Turkey: Pegem Academy. 2010;50-60.
14. Akgül A. *Statistical Analysis Techniques in Factor Analysis Medical Research SPSS Applications*. 9th ed. Ankara, Turkey: Emek Ofset Ltd., Sti; 2005:10-20.
15. Özdamar K. *Statistical Data Analysis with Package Programs*. 5th ed. Eskişehir, Turkey: Anadolu University Publisher; 2004: 22-30.
16. Büyükoztürk S. *Manual Data Analysis for Social Sciences*. Ankara, Turkey: Pegem Academy; 2012:12-18.
17. Alpar R. *Applied Statistics and Validity-Reliability with Examples from Sports, Health and Educational Sciences*. Ankara, Turkey: Detay Publisher; 2010:35-45.
18. Şencan H. *Reliability and Validity in Social and Behavioral Measurements*. Ankara, Turkey: Seçkin Publishers; 2005: 44-50.

**How to cite this article:** Ünal Aslan KS, Çetinkaya F. Validity and reliability of the Turkish version of the COPD exercise self-regulatory efficacy scale. *Clin Respir J*. 2019;00:1–7. <https://doi.org/10.1111/crj.13122>