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# Danish version of 'The COPD self-efficacy scale': translation and psychometric properties

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## Danish version of 'The COPD self-efficacy scale': translation and psychometric properties

The aim of the study was to translate 'The COPD self-efficacy scale' (CSES) into Danish and to evaluate the psychometric properties of the Danish version (CSES-DK). CSES enables assessment of self-efficacy in individuals with chronic obstructive pulmonary disease (COPD). The scale consists of 34 items, describing situations which may cause dyspnoea in patients with COPD. The CSES was translated into Danish using a standard forward-backward translation procedure. To estimate the reliability, measurements of internal consistency and repeatability were applied. The validity of the Danish version was evaluated by examining the associations between the CSES-DK score and socio-demographic variables (age, gender, education, disease severity and self-rated health). Factor analysis was conducted to compare the internal structure of the Danish version and the American source version. The study included 151 patients with COPD, recruited from three outpatient clinics. Estimates of reliability were in accordance with the original version of CSES (Cronbach's  $\alpha = 0.97$ , test-retest  $r = 0.82$ ,  $p < 0.001$ ). Significant correlations were obtained between the CSES-DK total score

and vocational training and education ( $r = 0.27$ ,  $p = 0.001$ ), disease severity ( $r = -0.27$ ,  $p = 0.001$ ) and self-rated health ( $r = -0.41$ ,  $p < 0.001$ ), indicating construct validity. Five factors were extracted from both versions of CSES. However, in the CSES-DK, only one factor concerns emotions, whereas two factors describing emotions were obtained for the original scale. Furthermore, important discrepancies exist with respect to the direction of the scoring of CSES. In some studies, a high score indicates high self-efficacy, whereas it indicates low self-efficacy in other studies, which complicates the comparison of studies. The Danish version of CSES showed acceptable measurements of reliability and validity. Potential limitations of the scale were identified, and discrepancies exist between the factor structure of the original and Danish version. Consequently, more studies of the factor structure should be conducted on both the original CSES and the translated versions of the instrument.

**Keywords:** chronic obstructive pulmonary disease, self-efficacy, COPD self-efficacy scale, translation, psychometric properties, factor analysis.

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## Introduction

Dyspnoea is the most significant symptom in chronic obstructive pulmonary disease (COPD) and increases as the disease progresses (1). Dyspnoea has implications for the patients' daily activities and may lead to physical impairment and confinement to the home (2). However, these

restrictions may not only be due to physical disabilities because research has shown associations between dyspnoea, functional performance and self-efficacy in patients with COPD (3). Self-efficacy refers to the patient's beliefs in his capabilities to execute the courses of action required to attain important goals. Control is a key concept in self-efficacy theory and does not only concern control of behaviour, but also self-regulation of thought processes, motivation and physical condition. According to the theory, the patient can interpret bodily signals such as dyspnoea and physical deterioration as a loss in physical capacity, which can influence the COPD patient's self-efficacy negatively (4). Hence, the patient's self-efficacy beliefs may influence the activities and behaviour of the patient (5).

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Chronic obstructive pulmonary disease patients' confidence in their ability to control their breathing difficulties has been identified as a predictor for preference of home care treatment of exacerbation (6). Furthermore, self-efficacy is associated with anxiety, quality of life (7), depression and exercise tolerance in patients with COPD (8). Hence, self-efficacy is an important clinical outcome when researching within the field of treatment and care for patients with COPD.

According to Bandura (4), self-efficacy should not be seen as an omnibus trait but as a differentiated set of self-beliefs linked to distinct realms of functioning, which suggests that a dimension-specific scale should be used when assessing self-efficacy in patients with COPD (9). 'The COPD self-efficacy scale' (CSES), developed by Wigal et al. (5), aims at assessing self-efficacy in individuals afflicted by COPD. The scale consists of 34 items describing situations, which may cause dyspnoea in patients with COPD. The respondents are asked to rate, on a five point scale (10), their confidence in their ability to manage or avoid breathing difficulties in a variety of situations (5). An overall self-efficacy score can be derived calculating the sum of the individual item scores and, if preferred, this sum may be divided by the number of items to derive an average score per item. For both the total score and the average item score, low scores indicate low self-efficacy (8). Based on a principal component analysis, five factors have been extracted from the American version of CSES: negative effect, intense emotional arousal, physical exertion, weather/environment and behavioural risk factors (5). If this factor structure can be demonstrated to be robust, it may form the basis for a more differentiated scoring of the instrument.

According to Bandura (4), people rely partly on somatic information conveyed by physiological and emotional states, especially in domains that involve health functioning. Thus, the CSES score may be associated with health functioning measurements such as self-rated health and disease severity. In social cognitive theory, internal factors, behaviour and the external environment influence one another bidirectionally. Furthermore, Bandura (4) states that personal agency operates within a broad network of sociostructural influences. Based on these assumptions, an association between self-efficacy and educational level may be found.

The CSES was originally validated on 102 outpatients (54 men, 48 women, mean age 66.8 years, SD 8.6) diagnosed with chronic bronchitis, emphysema or both. CSES displays satisfactory psychometric properties with Cronbach's  $\alpha = 0.95$  and test-retest reliability,  $r = 0.77$  (5). To apply CSES into a Danish context, a Danish version is needed, and therefore, the aim of the study was to translate 'The COPD self-efficacy scale' into Danish and to evaluate the psychometric properties, reliability and validity of the Danish version (CSES-DK).

## Materials and methods

The study consisted of three parts; translation of CSES into Danish, followed by a pilot test and subsequently an evaluation of the psychometric properties of the Danish version of CSES.

### Translation procedure

Permission to translate and use CSES was obtained from the corresponding author of the paper presenting the source version of CSES (5).

The translation of CSES was performed using a standard forward-backward translation procedure (11). Three independent translations were carried out (by the authors CE, SRH, ELM) and merged to create a common version. This version was back-translated into English by a native English-speaking psychologist. The back-translation was compared to the source version by a committee (12, 13) consisting of four health professionals (CE, SRH, BØ, KP) familiar with patients with COPD. The committee found minor discrepancies between the source version and the back-translation which, in most cases, reflected the richer vocabulary in the English language.

The final version of CSES-DK was pilot tested in five outpatients with COPD. As a consequence of the pilot test, the introduction to the questionnaire was simplified because the patients had difficulties understanding the instructions.

### Participants

The participants in the study were recruited from three outpatient clinics in the greater Copenhagen area. To participate, the patients had to have been diagnosed with COPD ( $FEV_1 < 80\%$ ,  $FEV_1/FVC < 0.7$ ) (14) before the current visit to the outpatient clinic. All four stages of COPD, as classified by GOLD (15), were included in the study. Exclusion criteria were inability to read and understand Danish and cognitive impairments that might cause difficulties understanding the information and instructions for the study. This was evaluated by the investigator and the health professionals at the outpatient clinics.

There is no consensus regarding the necessary sample size in validation studies (16), but this study aimed at including a minimum of 100 patients (9). Age, gender and disease severity were registered for all potential respondents to identify possible differences between the patients participating in the study and the patients that declined (17).

The study was approved by the Danish Data Protection Agency. Approval was not required from the Danish Scientific Ethical Committee because the study only involves questionnaire data. Before entering the study, eligible patients received oral and written information about the

study. Informed consent was obtained after the participants had been informed about their right to withdraw from the study, confidentiality and the protection of anonymity.

### *Design of the validation study*

A cross-sectional sample of patients with COPD was recruited from the three outpatient clinics over a 10-month period in 2009. All participants received both oral and written instructions and could answer the questionnaire either during their visit to the clinic or at home, provided with a stamped and addressed envelope. Participants who completed the questionnaire were mailed a second copy of the questionnaire with a stamped envelope within 2 weeks after returning the first questionnaire. If an item was omitted, respondents were asked to note the reason for this, to identify the reasons for omissions (10).

For validation purposes, the respondents were asked to complete a supplementary questionnaire, providing information about gender, age, educational level, number of years with COPD and self-rated health. Information on educational level was obtained with a question on schooling (five levels) and a question on vocational training and education (five levels).

Information about the respondents' self-rated health was obtained using a single question on self-reported global health. The respondents were asked to rate their health in general as: very good = 1, good = 2, fair = 3, poor = 4, very poor = 5 (18). Furthermore, the respondents' FEV<sub>1</sub> and disease severity were registered, using the GOLD guidelines (15).

### *Analysis*

The distribution of the CSES-DK total score was evaluated by calculating skewness and kurtosis, and by the one sample Kolmogorov-Smirnov test. These analyses suggested that the scores were approximately normal distributed and, consequently, means and SDs will be presented.

To optimise the statistical power, all analyses were conducted on a dataset with imputed item scores (9). The imputed scores were derived by assigning the mean of the respondent's completed items to the missing items (10).

To estimate the reliability of the CSES-DK, measurements of internal consistency (Cronbach's  $\alpha$  coefficient) and repeatability (test-retest measured by Pearson's  $r$ ) were applied. The test-retest correlation was based on the scores of the respondents who had completed both copies of the questionnaire. The validity of the Danish version of CSES was evaluated by examining the Pearson correlations between disease- and socio-demographic variables and the test score on CSES-DK (19).

The factor structure of the original version of CSES was evaluated by principal component factor analysis with

Varimax rotation (5). To compare the source version to the Danish version of the questionnaire, this analysis was also conducted on the scores from the first administration of the CSES-DK. However, because it is likely that the underlying factors may be correlated, an oblique Promax rotation will be presented instead of the Varimax rotation (9). Furthermore, the observed factor structure was used to derive subscales of the Danish version of CSES. Coefficient alpha was used to evaluate the reliability of these scales, and Pearson correlations were used to evaluate associations among the subscales (19).

The data analyses were carried out using *SPSS* 17.0 for Windows (SPSS Inc., Chicago, IL, USA). A  $p$ -value < 0.05 was considered statistically significant.

## **Results**

### *Participants*

One hundred and eighty-nine patients met the inclusion criteria of whom 163 patients agreed to participate. A total of 151 patients returned the first administration of the questionnaire, resulting in a response rate of 92.6%. The participants had a mean age of 67.56 years (SD 9.75), ranging from 36 to 87 years. Number of years with COPD ranged from 0 to 32 (mean 5.94 years, SD 6.19).

One hundred and twenty-seven respondents received the second administration of the questionnaire; hence, 24 respondents were not invited to participate in the retest. This group consisted of four patients who did not wish to participate in the retest, and 20 patients who were recruited while participating in a COPD rehabilitation programme and therefore not eligible for the retest. One hundred and four patients returned the second questionnaire, resulting in a response rate of 81.9%. However, two patients were excluded from the analyses because of late return of the retest questionnaire (>100 days).

Table 1 presents characteristics for respondents and nonrespondents. The analyses showed no significant differences between the respondents and nonrespondents at the first or second administration.

### *Scale properties*

The calculation of skewness and kurtosis (skewness = -0.04 and kurtosis = -0.62) and the one sample Kolmogorov-Smirnov test ( $p = 0.86$ ) suggested that the distribution of the total score was approximately normal.

A total of 103 (68%) respondents completed the first administration of CSES-DK without any missing items. Seventeen percent of the returned questionnaires had one missing item. Furthermore, two missing items occurred in 5% of the questionnaires and 6% had three missing items. The highest omission rates were on item 6, 'when I try to deny that I have respiratory difficulties', item 11, 'when I

**Table 1** Respondents and nonrespondents in the first and second administration

	First administration			Second administration		
	Respondents <i>n</i> = 151	Nonrespondents <i>n</i> = 38	<i>p</i>	Respondents <i>n</i> = 102	Nonrespondents <i>n</i> = 23	<i>p</i>
Gender (%)						
Male	61 (40.4)	11 (28.9)	0.19 <sup>a</sup>	37 (36.3)	9 (39.1)	0.80 <sup>a</sup>
Female	90 (59.6)	27 (71.1)		65 (63.7)	14 (60.9)	
Age (years), mean (SD)	67.56 (9.75)	67.37 (12.36)	0.93 <sup>b</sup>	67.08 (9.41)	66.93 (12.15)	0.65 <sup>b</sup>
COPD stage (%)						
Mild	3.3	2.9	0.55 <sup>a,c</sup>	2.0	4.3	0.28 <sup>a,c</sup>
Moderate	33.3	34.2		38.2	34.8	
Severe	42.7	48.6		38.2	52.2	
Very severe	20.7	14.3		21.6	8.7	

COPD, chronic obstructive pulmonary disease.

<sup>a</sup>Chi-square.

<sup>b</sup>Independent *t*-test.

<sup>c</sup>Recoded into three categories (mild–moderate, severe and very severe COPD).

feel sexually inadequate or impotent', and item 21, 'when I drink alcoholic beverages' (9.3, 13.9 and 8.6%, respectively). Table 2 presents the completion rate, mean score and standard deviation for each item.

The mean total score in the first administration (*n* = 151) was 111.62 (SD 29.02), with scores ranging from 38 to 170. The second administration (*n* = 102) displayed a total mean score of 109.25 (SD 32.41), ranging from 34 to 170. A paired samples *t*-test showed a statistically significant difference between the total score in the first and second administration of the questionnaire (*t* = 2.50, *df* = 101, *p* = 0.01).

### Reliability

The Cronbach's  $\alpha$  coefficient was 0.97 for the first administration of the questionnaire. Retest analyses were performed on 102 respondents. As illustrated in Table 1, the respondents and the nonrespondents in the retest did not differ significantly with regard to gender, age or disease severity. The respondents returned the retest questionnaire within 11–47 days (mean 24.64, SD 7.41) after the first administration. The Pearson correlation between the first and second administration of CSES-DK was *r* = 0.82, *p* < 0.001. Thus, the estimates of reliability are in accordance with the original version of CSES (5).

### Validity

The item-total correlations ranged from 0.40 to 0.79 (see Table 2), indicating high internal consistency. Table 3 displays the correlations between the CSES-DK total score and the socio-demographic variables. Age, years with COPD and schooling were not significantly correlated with

the CSES-DK score. Correlations between the CSES-DK score and a number of variables were moderate, but highly significant: vocational training and education (*r* = 0.27, *p* = 0.001), disease severity (*r* = -0.27, *p* = 0.001) and self-rated health (*r* = -0.41, *p* < 0.001).

### Factor structure of the CSES-DK

The factor analysis was based on data from the first administration of CSES-DK (*n* = 151). Using the eigenvalues >1 criterion, five factors were extracted (9), explaining 69.7% of the total variance. The Promax rotated factors are presented in Table 4.

The first factor extracted accounted for 14% of the variance. The 16 items loading on this factor are associated with emotions. The second factor, which explained 10% of the variance, included eight items which are primarily related to physical strain. Factor 3 accounted for 9% of the variance and consisted of four items associated with weather/environment. The fourth factor consisted of two items related to diet/alcohol and accounted for 5.5% of the variance, whereas factor 5 accounted for 7% of the variance and consisted of four items. These items are concerned with physical and emotional exhaustion. Item 18, 'when I laugh a lot', had high loadings on four of the five factors (0.53–0.58) and thus, the factorial status of this item remains ambiguous.

Table 5 presents the Pearson correlations between the extracted factors in the Danish version of CSES. The correlations are predominantly high, except the correlation between factor 2 and factor 4 (*r* = 0.22). The high correlations, especially between the factor scores and the CSES-DK score, indicate substantial overlap between the results of each factor and the CSES-DK score.

**Table 2** Completion rate, mean score, SD and item-total correlation for each item in the COPD self-efficacy scale (CSES)-DK

Item number	Item <sup>a</sup>	N	Mean score	SD	Item-total correlation
1.	When I become too tired	150	3.70	1.09	0.68
2.	When there is humidity in the air	151	3.23	1.28	0.63
3.	When I go into cold weather from a warm place	151	3.34	1.10	0.64
4.	When I experience emotional stress or become upset	151	3.31	1.18	0.65
5.	When I go up stairs too fast	150	2.93	1.40	0.59
6.	When I try to deny that I have respiratory difficulties	137	3.26	1.24	0.72
7.	When I am around cigarette smoke	150	3.49	1.22	0.62
8.	When I become angry	150	3.43	1.18	0.72
9.	When I exercise or physically exert myself	148	2.95	1.39	0.60
10.	When I experience too much excitement	150	3.28	1.23	0.78
11.	When I feel sexually inadequate or impotent	130	3.20	1.36	0.75
12.	When I am frustrated	149	3.48	1.18	0.79
13.	When I lift heavy objects	148	2.87	1.42	0.64
14.	When I begin to feel that someone is out to get me	147	3.32	1.31	0.75
15.	When I yell or scream	141	3.36	1.25	0.76
16.	When I am lying in bed	150	3.94	1.18	0.40
17.	During very hot or very cold weather	149	3.21	1.21	0.58
18.	When I laugh a lot	149	3.60	1.12	0.62
19.	When I do not follow a proper diet	150	3.67	1.21	0.48
20.	When I feel helpless	151	3.30	1.24	0.74
21.	When I drink alcoholic beverages	138	3.66	1.24	0.49
22.	When I get an infection	150	2.80	1.29	0.61
23.	When I feel detached from everyone and everything	145	3.38	1.26	0.69
24.	When I experience anxiety	150	3.09	1.31	0.71
25.	When I am around pollution	150	3.04	1.27	0.65
26.	When I overeat	149	3.42	1.29	0.63
27.	When I feel down or depressed	150	3.44	1.26	0.75
28.	When I breathe improperly	151	2.90	1.27	0.72
29.	When I exercise in a room that is poorly ventilated	144	2.82	1.31	0.59
30.	When I am afraid	149	3.19	1.28	0.72
31.	When I experience the loss of a valued object or a loved one	149	3.09	1.30	0.67
32.	When there are problems in the home	149	3.54	1.19	0.70
33.	When I feel incompetent	147	3.59	1.16	0.69
34.	When I hurry or rush around	149	2.85	1.44	0.60

COPD, chronic obstructive pulmonary disease.

<sup>a</sup>The questionnaire is introduced by the following phrase; 'Determine how confident you are that you could manage breathing difficulty or avoid breathing difficulty in that situation' (5).

**Table 3** Correlations between the COPD self-efficacy scale (CSES)-DK total score and disease- and socio-demographic variables

	Pearson correlations (95% CI)	p
Gender	0.10 (-0.06, 0.25)	0.23
Age	-0.02 (-0.18, 0.14)	0.77
Years with COPD	-0.06 (-0.22, 0.11)	0.48
Disease severity (GOLD stage)	-0.27* (-0.41, -0.11)	0.001
Self-rated health	-0.41* (-0.54, -0.27)	<0.001
Schooling	0.13 (-0.03, 0.29)	0.11
Vocational training and education	0.27* (0.12, 0.42)	0.001

CI, confidence interval; COPD, chronic obstructive pulmonary disease.

\*Correlation is significant at the 0.01 level (two-tailed).

**Table 4** The factor structure of the COPD self-efficacy scale (CSES)-DK (Promax rotation)

<i>Item number</i>	<i>Item</i>	<i>Loading</i>
<i>Factor 1: Emotions</i>		
<i>Cronbach's <math>\alpha</math> coefficient = 0.96, 14% of the variance</i>		
4.	When I experience emotional stress or become upset	0.77
8.	When I become angry	0.78
10.	When I experience too much excitement	0.83
11.	When I feel sexually inadequate or impotent	0.72
12.	When I am frustrated	0.84
14.	When I begin to feel that someone is out to get me	0.72
15.	When I yell or scream	0.74
20.	When I feel helpless	0.81
23.	When I feel detached from everyone and everything	0.79
24.	When I experience anxiety	0.81
26.	When I overeat	0.64
27.	When I feel down or depressed	0.86
30.	When I am afraid	0.83
31.	When I experience the loss of a valued object or a loved one	0.78
32.	When there are problems in the home	0.80
33.	When I feel incompetent	0.78
<i>Factor 2: Physical strains</i>		
<i>Cronbach's <math>\alpha</math> coefficient = 0.93, 10% of the variance</i>		
5.	When I go up stairs too fast	0.82
9.	When I exercise or physically exert myself	0.85
13.	When I lift heavy objects	0.78
22.	When I get an infection	0.74
25.	When I am around pollution	0.82
28.	When I breathe improperly	0.84
29.	When I exercise in a room that is poorly ventilated	0.84
34.	When I hurry or rush around	0.83
<i>Factor 3: Weather/environment</i>		
<i>Cronbach's <math>\alpha</math> coefficient = 0.85, 9% of the variance</i>		
2.	When there is humidity in the air	0.83
3.	When I go into cold weather from a warm place	0.76
7.	When I am around cigarette smoke	0.71
17.	During very hot or very cold weather	0.77
<i>Factor 4: Diet/alcohol</i>		
<i>Cronbach's <math>\alpha</math> coefficient = 0.71, 5.5% of the variance</i>		
19.	When I do not follow a proper diet	0.77
21.	When I drink alcoholic beverages	0.73
<i>Factor 5: Physical and emotional exhaustion</i>		
<i>Cronbach's <math>\alpha</math> coefficient = 0.79, 7% of the variance</i>		
1.	When I become too tired	0.73
6.	When I try to deny that I have respiratory difficulties	0.69
16.	When I am lying in bed	0.81
18.	When I laugh a lot	0.61

COPD, chronic obstructive pulmonary disease.

**Table 5** Correlations between the factors in the COPD self-efficacy scale (CSES)-DK

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1	1	–	–	–	–
Factor 2	0.57*	1	–	–	–
Factor 3	0.59*	0.69*	1	–	–
Factor 4	0.60*	0.22*	0.40*	1	–
Factor 5	0.74*	0.50*	0.60*	0.54*	1
CSES total score	0.94*	0.79*	0.77*	0.59*	0.80*

COPD, chronic obstructive pulmonary disease.

\*Correlation is significant at the 0.01 level (two-tailed).

## Discussion

The present study has generated a Danish version of 'The COPD self-efficacy scale'. The reliability estimates for the Danish version of CSES were similar to the estimates obtained for the original version of the scale (5).

The high item-total correlations and the correlations between the derived factors suggest that CSES-DK scores primarily reflect a single construct. Furthermore, the results of the analyses suggest that the underlying construct is associated with the respondents' perception of their own health and the disease severity. The association between self-rated health, disease severity and CSES-DK total score is in line with Bandura's self-efficacy theory, describing how bodily signals and symptoms can influence the patients' self-efficacy (4). Thus, these results may be interpreted as an indication of construct validity (19).

The results showed a small and insignificant correlation between the CSES-DK score and schooling, and a moderate and significant correlation between the CSES-DK score and vocational training and education. The significant correlation is in contrast to the Norwegian validation study of CSES, which did not find a significant correlation between CSES and education (20), but the Norwegian study did not discriminate between schooling and vocational training and education.

Other studies have reported findings similar to the results of the present study. The Pearson correlations showed no significant association between age, gender and the CSES score, which is similar to the results reported by Garrod et al. (8) and Bentsen et al. (20). In the present study, a significant correlation was obtained between the CSES-DK score and self-rated health. To our knowledge, no other studies have evaluated the association between self-rated health and self-efficacy in patients with COPD, using the CSES. However, associations have been found between self-rated health and mastery in patients with COPD, assessed by the chronic respiratory questionnaire mastery subscale. In that study, subjects who reported poor

health had lower confidence in their ability to manage their COPD compared with subjects who reported good health (21), which is in agreement with the results of the present study.

This study observed a relatively high number of unanswered items. Bissonnette et al. (22) also reported on items that were not applicable, particularly item 11 and item 21. Furthermore, the Norwegian validation study reports omission rates up to 19% (20), and the items with high omission rates are similar to the omitted items in the Danish validation study. According to Bandura (4), mastery experience is the primary source of self-efficacy. Therefore, a possible explanation for the high number of unanswered items is that the respondents could not relate to situations with which they had no experience, which is supported by the statements of the respondents during the validation study.

The main discrepancy between the original version of CSES and the Danish version is the factor structure. Five factors were extracted in both versions, but in the Danish version only one factor concerns emotions, whereas two factors describing emotions were obtained for the original scale ('negative affect' and 'intense emotional arousal'). A supplementary analysis showed that the two emotion factors correlated 0.92 in the Danish sample, explaining why only one emotion factor was obtained in our analysis. In addition to cultural and translation factors, it should be remembered that the analysis of the original CSES was based on only 102 patients (5).

Important discrepancies exist with respect to the direction of the scoring in the currently available literature. In some studies, a high score indicates high self-efficacy (8, 23), whereas it indicates low self-efficacy in other studies (7, 22). Furthermore, there is no consensus on how the CSES score should be presented. Some authors present an overall scale mean score (3), whereas others present a score for each factor (23, 24). The use of different scoring procedures complicates comparison of studies and we hope this paper can contribute to a more uniform scoring procedure.

The high correlations between the factor scores shown in Table 5 suggest that the total CSES-DK score will be sufficient in most contexts, which is also recommended by Wigal. The predictive power of the total score and the five factors can often be compared in research contexts, and while the intercorrelations among the factors are high, there is clearly nonoverlapping variance. Consequently, the factor scores may be useful when detailed information on self-efficacy in different contexts is needed (5). If factor scores are essential for the interpretation of the data in a Danish setting, the factor scores should be derived from the Danish factor structure.

We have noticed that the paper presenting the source version of CSES contains two different phrasings of item 10. In the appendix, item 10 is phrased as 'when I feel



distressed about my life', whereas Table 1 in the paper presents item 10 as 'when I experience too much excitement' (5). Email correspondence with Wigal has confirmed that the valid item is 'when I experience too much excitement' and that the authors had not been aware of this discrepancy, up to this point. Thus, previous studies applying the CSES may have used the incorrect version of item 10, which may impede the comparison of studies.

#### *Methodological limitations*

A limitation to the generalisability of the present results is that the study only included outpatients. However, because of the measures of reliability and the fluctuating nature of COPD, it was considered important to validate the scale on stable COPD patients. A further reason for choosing the outpatient setting was to facilitate the comparison of the psychometric properties of the Danish version to the original version, as presented by Wigal et al. (5).

The evaluation of the psychometric properties of the CSES-DK could have been strengthened further by evaluating the responsiveness of the scale. However, this would have interfered with the evaluation of repeatability reliability. The original version of CSES has been evaluated in terms of responsiveness and displays sensitivity to change (22).

The validation of the Danish version of CSES primarily focused on construct validity. The convergent validity could have been strengthened by comparing the CSES-DK to other self-efficacy scales. However, self-efficacy is a dimension-specific construct (4), and to our knowledge, no validated Danish self-efficacy scale exists for patients with COPD.

The disease severity was not reported in the original validation study, which may impede the comparison to the Danish respondents. Furthermore, the patients in the two studies were included under different criteria for diagnosing COPD. The respondents in the source version validation study were included on the basis of reporting chronic bronchitis, emphysema or both (5), which was previously used as a definition of COPD (15). However, the current practice for the diagnosis of COPD follows the NICE guidelines (14), which have been applied in the present study.

#### *Implications of the study*

The present study has implications for clinical practice as well as for researchers. Information about COPD patients' self-efficacy will enable health professionals to organise interventions designed to increase the patients' self-efficacy in specific situations (5). Future CSES validation studies should include COPD patients with exacerbation to

investigate the use of the scale in the acute phase of COPD. Furthermore, little is known about the responsiveness of the CSES-DK, which should be tested in a Danish setting.

#### **Conclusion**

A Danish version of 'The COPD self-efficacy scale' (CSES-DK) has been developed. The Danish version of CSES showed sufficient reliability, corresponding to the original version of CSES. Analyses showed an association between the underlying construct and relevant disease- and socio-demographic variables, as an indication of construct validity.

The evaluation of the psychometric properties of the CSES-DK has identified potential limitations of the scale, and discrepancies exist between the factor structure of the original and Danish version. In most contexts, it will be sufficient to report the CSES total score, but if the nature of a Danish study requires factor scores, they should be based on the Danish factor structure. Furthermore, more studies of the factor structure should be conducted on both the original CSES and translated versions of the instrument.

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#### **Author contribution**

The first author, Christina Emme, conceived, planned and executed the study as well as wrote the manuscript. Erik Lykke Mortensen and Susan Rydahl-Hansen contributed to the design of the study, and also analysis and interpretation of the data. Along with the aforementioned co-authors, Klaus Phanareth and Birte Østergaard contributed to the manuscript by revising the content critically. All authors have read and accepted the manuscript, and there are no conflicts of interest.

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