Thorac Res Pract. 2023; 24(3): 117-122 DOI: 10.5152/ThoracResPract.2023.22059

Original Article

Validity and Reliability of the Vietnamese Version of the Inhaler Use Scale for Chronic Obstructive Pulmonary Disease Patients

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Cite this article as: Thi Thu Trieu N, Şanlıtürk D, Upvall M, Thi Thuy P, Van Long T, Thi Anh Phuong N. Validity and reliability of the vietnamese version of the inhaler use scale for chronic obstructive pulmonary disease patients. *Thorac Res Pract.* 2023;24(3):117-122.

Abstract

OBJECTIVE: The purpose of this study was to establish and evaluate the validity and reliability of the Vietnamese version of the inhaler use scale for chronic obstructive pulmonary disease patients.

MATERIAL AND METHODS: This study was conducted with 150 participants who were admitted to the Outpatient Department of Pulmonary Diseases in Vietnam, using a face-to-face interview technique. The Kaiser-Meyer-Olkin test, Bartlett's test, and exploratory factor analysis were used to assess construct validity. Cronbach's alpha coefficient and intraclass correlation coefficient were used to evaluate the reliability of the scale.

RESULTS: In the results of exploratory factor analysis with eigenvalues > 1.00, 3 factors of scale appeared. The total variance of the questionnaire was 78.78%, where variances of each component were 34.16%, 26.88%, and 17.73%, respectively. Cronbach's alpha coefficients of scale in the first test and re-test after 4 weeks were 0.913 and 0.901, respectively. The intraclass correlation coefficient was 0.826.

CONCLUSION: The validity and reliability of the Vietnamese version of the inhaler use scale study were found to be equivalent to the original author-developed scale and it can be applied to measure the factors affecting behavioral intention in Vietnamese chronic obstructive pulmonary disease patients.

KEYWORDS: Validity, reliability, COPD, Vietnamese
Received: *March 21, 2022* ***Accepted:*** *November 16, 2022* ***Publication date:*** *February 6, 2023*

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a common, preventable, and treatable disease. Characterized by persistent symptoms and airway or alveolar limitation, COPD often occurs from exposure to toxic particles and gases. Comorbidities will also increase disability and mortality.[1]

As of 2020, nearly 3 million deaths can be attributed to COPD globally every year, and the frequency is increasing due to smoking in developing countries, aging populations, and the environment. Chronic obstructive pulmonary disease frequency increases by 2060, with about 5.4 million projected COPD-related deaths.[1] In Vietnam, the prevalence of COPD is estimated to be 6.7%, the highest in Southeast Asia. More than half of these cases have experienced at least 1 episode of the severity of the disease.[2]

Early treatment and adherence to the doctor's instructions can reduce symptoms, slow down lung damage, and improve patients' quality of life.[1] Inhaled medications are becoming increasingly popular in the treatment of COPD. On the contrary, improper use of the technique will reduce the drug's effectiveness. Unlike oral medications, inhaled drugs require the patient to perform the correct inhalation technique to achieve the optimal therapeutic effect.[3]

Poor inhaler technique can significantly reduce the effective delivery of the respirable fraction of the emitted dose that reaches the lungs.[4] In clinical studies, up to 94% of patients demonstrated incorrect inhalation with metered-dose inhalers (MDI) or dry powder inhalers (DPI),[5] but only 22% of patients reported that they were completely confident in using their inhaler correctly.[6] Ngo et al[7] demonstrated that the proportion of patients with good inhalation technique was 22.7% for an MDI, 30.4% for a DPI, and 31.8% for a soft mist inhaler. The whole exhalation technique was the most common mistake in COPD patients observed in the study.

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Proper use of inhalation devices is one of the most important aspects to be taken into account when assessing the treatment progress of patients with COPD, and the instructions emphasize the importance of assessing inhalation techniques to improve the effectiveness of drug delivery. However, not all patients will perform properly because of cognitive or physical reasons, or both (Jardim & Nascimento, 2019).

The inhaler use scale (IUS) developed by Sanlıturk and Ayaz[8] consists of 13 questions to measure the degree of intention changing behavior of people with COPD toward the use of inhalation devices in the treatment of the disease. The IUS was developed based on the Theory of Planned Behavior (TPB) to measure the factors affecting the intention changing behavior, including 3 subscales: attitude toward behavior (ATB), subjective norm (SN), and perceived behavioral control (PBC).

The IUS has been tested for validity and reliability on 130 asthmatics with Cronbach's alpha coefficient of 0.72. Calculating the value of the scale by factor analysis results in Kaiser-Meyer-Olkin (KMO) coefficient of 0.763, eigenvalues > 1.00 (the eigenvalues of ATB, SN, and PBC are 3.790, 1.793, 1.789, respectively), and total variance of 52.087% (29.151%, 13.790%, and 9.145% respectively).[8] However, there were no publications and versions of the IUS for the Vietnamese population. Thus, in this study, we have established and evaluated the validity and reliability of the Vietnamese version of the IUS (V-IUS) for COPD patients.

MATERIALS AND METHODS

Study Designs and Participants

This study was conducted using a face-to-face interview technique on patients who were admitted to the Outpatient Department of Pulmonary Diseases at Da Nang C Hospital Vietnam from October 2021 to February 2022. Simple random sampling was used to recruit patients with the following criteria: FEV1/FVC < 0.70 in respiratory function test, aged 40 years and over, patients who were able to establish healthy communication including reading literacy, and who did not have hearing and/or speech disorder.

Hair (2019) suggested that the sample size be determined based on determining a ratio of 5 or 10 participants per sale item. The IUS questionnaire consists of 13 items; the sample size was then determined to be 13 × 10 = 130. The expected rate was 10%; therefore, the final sample size was 150.

MAIN POINTS

- The study evaluates many attributes of the inhaler use scale questionnaire in Vietnamese version, including internal reliability, surface validity, content validity, and structural validity.
- Vietnamese version of the inhaler use scale has good content value, high structural value, and high internal reliability.
- Vietnamese version of the inhaler use scale can be applied to measure the factors affecting behavioral intention in Vietnamese chronic obstructive pulmonary disease patients.

This study was approved by ethical review committee of Nam Dinh University of Nursing (No. 1681/GCN-HĐĐD) and permissions for data collection from the authorities of Da Nang C Hospital. All participants agreed to sign an informed consent to participate in this study after received a full explanation about the study from the researcher.

Data Collection Instruments

Both the questionnaire developed by Sanlıturk and Ayaz[8] and the subsequent translated version, V-IUS, were used in collecting study data.

Inhalers Use Scale

The IUS includes 13 questions to measure the degree of intention to change behavior of people with asthma with respect to target behaviors desired to be changed. The IUS was developed according to the TPB. This theory was used to measure the factors affecting behavioral intention including 3 subscales: ATB, SN, and PBC. Each item was rated on a 5-point Likert-type scale (strongly agree: 5, agree: 4, undecided: 3, disagree: 2, and strongly disagree: 1) Of the 13 items included in IUS, the first item represented the general intent; items 3, 7, and 9 represented ATB; items 2, 4, 6, 8, 11, and 13 represented SN; and items 5, 10, and 12 represented PBC.[8]

The scores for each group were calculated separately, with the behavior intention scores ranging from 1 to 5 points. Scores of the group ATB, SN, and PBC were calculated by adding the scores of all questionnaire items divided by the number of questions in the group. Only question 7 (ATB) was written as negative, requiring this item to be reversed-scored. While evaluating the scales, we determined the impact of the factors affecting the behavioral intentions of the patients. Accordingly, the higher the ATB score, the more aware the patient is of the behavior. The higher the score on the SN, the more environmental pressure the patient experienced to perform the target behavior. The higher the score on the SN, the more environmental pressure the patient experienced to perform the target behavior.[8]

Translation of the Inhalers Use Scale

The researchers received permission to use the IUS after agreeing to allow each question to be translated from English to Vietnamese. According to the World Health Organization, 2009 procedure, the translation process is best carried out using a clearly defined approach. In the study, the following steps were implemented: first, the original IUS was translated from English into Vietnamese by 2 English lecturers at the University of Foreign Languages, Hue University (the lecturers are Vietnamese who are proficient in English). Second, some inconsistencies between the translations were discussed and agreed upon by the researcher and another interpreter. This translation from Vietnamese into English was done by a Vietnamese who again was proficient in the English language. Finally, this version was compared to the original IUS.[10]

The V-IUS was sent to 5 experts to assess the validity of the content by giving a score from 1 to 4, corresponding to the level of "1 not relevant" to "4 very suitable" of each item in the questionnaire compared to the research objective. The members of this assessment expertise council who met

the criteria included 2 doctors (master-degree qualified) specializing in respiratory internal medicine with experience in treating people with COPD; 2 nurses with doctorates with experience in teaching and guiding students at the Department of Respiratory Internal Medicine; and 1 PhD prepared employee working in the Department of Public Health with experience in building and developing toolkits.[10,11] All experts were proficient in English and have worked in their respective fields for more than 10 years.

The validity score derived from the experts was then used to calculate the content validity index for Items Content Validity Index (I-CVI) items. The I-CVI is calculated based on the number of experts giving a score of 3 or 4 on a 4-point Likert scale for an item divided by the total number of experts and has a value from 0 to 1. The I-CVI was compared with thresholds equivalent to the clarity of the questions: >0.79 (clear), 0.70-0.79 (should revise), and <0.70 (so cannot use). When there are 5 or less experts, the consensus of all experts is required to prove that the item has content validity (I-CVI = 1).[12]

The content validity of the IUS was determined based on the quantitative assessment scores of the experts. Independent assessors, all comments, criticisms, and recommendations for adjusting the questionnaire were recorded on the assessment minutes and verbally explained to graduate students at the time of receiving the assessment form. The time for experts to review the questionnaire was 7 days. After receiving the assessment form, the researcher summarized the results and opinions of the experts.[11]

Finally, a pilot study was conducted with 30 COPD patients. Out of a total of 30 persons surveyed by questionnaire, 26 said the questionnaire was "easy to understand" and 4 persons said it was "very easy to understand." The surveyed persons did not have any difficulty in reading, understanding, and grasping the content of the questionnaire, and there was no question making them uncomfortable when answering. All respondents believed that the questionnaire could survey aspects of inhaled medication use in COPD patients. The average response time was 7.8 minutes.

Data Analysis

This study used Statistical Package for the Social Sciences software version 23 to analyze the data. Descriptive statistics were used to describe the sample characteristics. An exploratory factor analysis (EFA) was performed to determine the main factor. Correlation matrix, Bartlett's test, and KMO test were performed to test the conditions for conducting factor analysis. The factors have an eigenvalue greater than 1, and the variation rate is explained by factors of 50% or more and the distribution of elements on the scree plot. Then, the rotated factor matrix, Vartimax, was used to determine the subitems of each component, with a condition that these subcategories have a factor loading greater than 0.5. In order to analyze the reliability of the Vietnamese version, Cronbach's alpha and total item correlation were performed to calculate the internal consistency of the scale, with Cronbach's alpha of 0.70 or higher considered acceptable. If the coefficient of correlation of the variable - total (Corrected Item-Total Correlation) ≥ 0.30 then the variable meets the requirements. The intraclass correlation coefficient (ICC) was used to assess the reproducibility of tests and retests between 2-time clinic visits (4 weeks apart) of 30 participants.

RESULTS

Characteristics of Research Subjects

Table 1 presents the characteristics of the study participants.

Validity and Reliability of the Inhaler Use Scale

Validity of the Inhaler Use Scale

To check the conditions for performing factor analysis of the questionnaire, the KMO study and Bartlett's tests were

Table 1. Characteristics of Participants (n = 150)

Characteristics	n	%
Age	Mean 60.48 (SD = ±8.33)	
Gender		
Male	117	78.0
Female	33	22.0
Education level		
Illiterate	1	0.7
Primary school	10	6.7
Junior high school	12	8.0
High school	19	12.7
Vocational school	43	28.7
College, University	65	43.3
Occupation		
Farmer	7	4.7
Worker	24	16.0
Public servants	46	30.7
Retired	51	34.0
Trader	21	14.0
Other	1	0.7
Living with family		
Yes	121	80.7
No	29	19.3
Comorbidity		
Yes	90	60.0
No	60	40.0
Using metered-dose inhaler		
Yes	102	68.0
No	48	32.0
Using turbuhaler		
Yes	10	6.7
No	140	93.3
Using accuhaler		
Yes	45	30.0
No	105	70.0
Number of year living with disease	11.6 (±5.8)	
Number of year using medicine	4.5 (±2.9)	

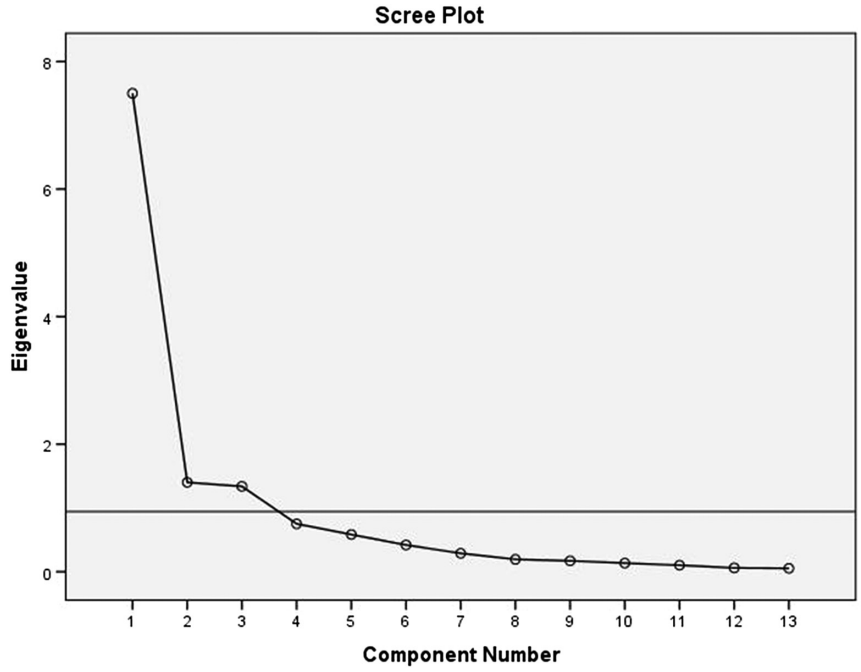

Figure 1. Scree Plot.

used. With the found KMO index of 0.864 (<0.5), it demonstrates that the sample size is sufficient for factor analysis. The Bartlett's test value with $P < .001$ indicated that there was enough correlation among the research variables to perform the factor analysis (Table 2).

In the results of EFA with eigenvalues > 1.00, 3 factors of scale appeared in the scree plot (Figure 1). The total variance of the questionnaire was 78.78%, where variances of each component were 34.16 %, 26,88%, and 17.73%, respectively. According to the results of rotation factor analysis using the principal component analysis, items 6, 8, and 11 represented for ATB subgroup were found in factor 3, items 5, 12, and 10 represented for PBC subgroup were found in factor 2, items 3 and 9 represented for SN subgroup were found in factor 1, and the general intent (item 1) was found in factor 1 (Table 3).

Reliability of the Inhaler Use Scale

The Cronbach's alpha coefficient was used to assess the internal consistency of the questionnaire. In this study, Cronbach's alpha coefficients of scale in the first-time survey with 150 samples (test) and the second-time survey with 30 samples (retest) were 0.913 and 0.901, respectively (Table 4).

Table 2. Kaiser-Meyer-Olkin (KMO) and Bartlett's Test Result of Inhaler Use Scale

KMO measure of sampling adequacy		**0.864**
Bartlett's test of sphericity	Approx. chi-square	1972,930
	df	78
	Significance	.000

The test–retest reliability of the questionnaire was evaluated 4 weeks after the first survey of the questionnaire. The intraclass correlation was used to measure the similarity between values from the same group in 2 times response. The ICC was 0.826. These values indicate that the V-IUS is a highly valid tool (Table 4).

DISCUSSION

The V-IUS is the Vietnamese version of the inhaled drug use scale to measure inhaled drug use in COPD patients, using

Table 3. Factor Analysis of Vietnamese Version of the Inhaler Use Scale

	Components		
	Factor 1	**Factor 2**	**Factor 3**
Item 3	0.861		
Item 9	0.844		
Item 2	0.843		
Item 13	0.829		
Item 1	0.557		
Item 5		0.866	
Item 10		0.863	
Item 4		0.797	
Item 12		0.751	
Item 7			0.804
Item 11			0.792
Item 8			0.650
Item 6			0.510

Factor 1, attitude toward behavior; Factor 2, perceived behavioral control; Factor 3, subjective norm.

Table 4. Test–Retest Reliability of V-IUS

	Cronbach's Alpha Coefficient Test	Cronbach's Alpha Coefficient Retest	ICC
V-IUS	0.913	0.901	0.826

ICC, intraclass correlation coefficient; V-IUS, Vietnamese version of the inhaler use scale.

EFA to assess the validity of the structure and reliability of the scale.

Comparing the validity and reliability of original IUS of authors named Sanlıturk and Ayaz[8] that developed and tested on asthma patients the translated version of IUS performed on Vietnamese people with COPD also showed the same finding with a good validity, and high reliability.

Results indicate that the V-IUS is very easy to use and, in the opinion of experts and patients, all questions are easy to understand. High internal consistency was observed (Cronbach's alpha = 0.913). The Cronbach's alpha coefficient reassessed after 4 weeks was 0.901 (Table 4), which is in the acceptable range of 0.7-0.95, demonstrating that the V-IUS questionnaire has good internal reliability and good reproducibility (ICC = 0.826).

Although the IUS was originally designed to measure the factors affecting behavioral intention in asthma patients, the V-IUS seems to work equally well in COPD patients possibly because both asthma and COPD patients use inhaled medication for the treatment of diseases. The patient's understanding of the questionnaire items may indicate that the patient has received clear information about the disease from the health workers. All of these are considered positive evidence that the V-IUS can be applied to measure the factors affecting behavioral intention in COPD patients.

Exploratory factor analysis reveals the concordance between the variables. The KMO and Bartlett's sphericity tests were used to evaluate the fitness of the study sample. The KMO must be higher than 0.60 and *P* must be less than .05 in Bartlett's test to analyze the data to be adequate in the factor analysis.[13] Kaiser-Meyer-Olkin sampling adequacy coefficient was found to be 0.864, and χ^2 value in Bartlett's sphericity test was found to be $P < .001$). According to these results, evaluated data were found to be adequate for factor analysis original questionnaire developed by Sanlıturk and Ayaz[8] comprised 3 subgroups, number of subgroups in the present study was limited to 3. The scale was composed of 13 items and 3 subgroups. The analysis revealed that the number of items in the subgroups was different from the number of items in the subgroups of the original form. Total variance of the questionnaire in EFA was 78.78% where variables of subscales were 34.16% for ATB, 26.88% for PBC, and 17.73% for SN.

According to the results of rotation factor analysis using principal component analysis, items 5, 12, and 10 represent the PBC group found in factor 2. This factor is completely similar to the factor of the original questionnaire and similar to the test results of the author on subjects with asthma. This result means that individuals' beliefs about the ease or difficulty of behavior remain the same regardless of country.[8]

The results show that item 1 is a question of general intention. According to Ajzen,[14] intention determines behavior, when the patient intends to perform a certain positive behavior they will strive to achieve. The results (Table 3) show that items 3 and 9 represent ATB in V-IUS for factor 1 and items 6, 8, and 11 represent SN for factor 3. This result is equivalent to the scale originally developed by the author based on the TPB theory. However, this result differs in the order of occurrence of factors compared with the test results of the author on subjects who are asthma patients.[8] All of this is acceptable because this study was conducted in COPD patients while the original questionnaire was experimentally performed on asthma patients. The results of the study demonstrate that the subtypes of ATB, SN, PBC, and general intention to measure factors affecting behavioral intention in asthma patients are suitable for measuring behavioral intention in Vietnamese patients with COPD.

Strengths and Limitations of the Study

The study evaluates many attributes of the V-IUS questionnaire, including internal reliability, surface validity, content validity, and structural validity. The findings show that the IUS questionnaire in Vietnamese version has good content value, high structural value, and high internal reliability. From the various validity and reliability tests, it appears that V-IUS could be a valid and reliable instrument to measure the factors affecting behavioral intention in COPD patients.

However, there was no involvement of native English speakers in the reverse translation phase. The study managed this limitation by inviting interpreters who were proficient in English and have lived and worked in English-speaking countries.

In summary, the V-IUS is a valid instrument that is useful and reliable for measuring the factors affecting behavioral intention in COPD patients in Vietnam.

CONCLUSION

Given the validity and reliability reported by V-IUS and its ease of use in COPD patients, this self-report measure could serve as a screening tool in clinical settings to measure the factors affecting behavioral intention in COPD patients in Vietnam.

Ethics Committee Approval: Ethical committee approval was received from the Ethics Committee of Nam Dinh University (Approval No: 1681, Date: 02/8/2021).

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – N.T.T.T., N.T.A.P., T.V.L., M.U., D.S.; Design – N.T.T.T., N.T.A.P., T.V.L., M.U., D.S., P.T.T.; Supervision – N.T.A.P., T.V.L.; Resources – N.T.T.T., N.T.A.P., T.V.L., M.U.; Materials – N.T.T.T., N.T.A.P., T.V.L., M.U.; Data Collection and/or Processing – N.T.T.T., P.T.T.; Analysis and/or Interpretation – N.T.T.T., P.T.T.; Literature Search – N.T.T.T., N.T.A.P., T.V.L., M.U., D.S., P.T.T.; Writing – N.T.T.T., N.T.A.P., T.V.L., M.U., D.S., P.T.T.; Critical Review – N.T.T.T., N.T.A.P., T.V.L., M.U., D.S., P.T.T.

Acknowledgments: The authors expressed appreciation to all participants and Da Nang C Hospital for supporting the study.

Declaration of Interests: The authors have no conflict of interest to declare.

Funding: Nguyen Thi Thu Trieu was funded by Vingroup JSC and supported by the Master, PhD Scholarship Programme of Vingroup Innovation Foundation (VINIF), Institute of Big Data, code VINIF.2021.TS.129.

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