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Validation of the Test of Adherence to Inhalers (TAI) among Taiwanese Patients with Chronic Obstructive Pulmonary Disease

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Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Background: It is important to have a psychometrically sound instrument assessing inhaler adherence of patients with chronic obstructive pulmonary disease (COPD). The present cross-cultural study aimed to validate the Chinese translation of the 10-item Test of Adherence to Inhalers (TAI) among 235 Taiwanese patients with COPD.

Material/Methods: The TAI was translated into Chinese and validated for Taiwanese patients with COPD. Eight experts evaluated the Chinese TAI, and their scores were used to examine content validity. Then, a total of 235 COPD patients (93.6% male, n=220; mean age=72.18 years, SD=10.19) were recruited using convenience sampling. A research assistant and a respiratory therapist conducted interviews to help patients complete the TAI and other related measures. Exploratory factor analysis, internal consistency, and relationship between TAI-defined adherence groups and the statement "*Don't take medicine when there are no symptoms*" were used to validate the Chinese TAI.

Results: The content validity and internal consistency of the Chinese TAI were good (content validity index=0.975 for relevance, and 0.988 for clarity; α=0.82). The exploratory factor analysis suggested a single-factor structure. Moreover, the TAI-defined adherence groups had significantly different responses to the statement "*Don't take medicine when there are no symptoms*".

Conclusions: The Chinese TAI assessing inhaler adherence among Taiwanese patients with COPD effectively helps patients with COPD to identify their inhaler adherence. Researchers and healthcare providers can use the translated TAI to monitor adherence to inhaler for patients with COPD in Taiwan.

Keywords: Adherence Interventions • Psychometrics • Taiwan

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3485 5 — 34

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Introduction

Chronic obstructive pulmonary disease (COPD) remains a significant global health challenge, as it is the fourth leading cause of death worldwide [1]. Symptoms such as breathlessness, chronic coughing, and fatigue not only diminish patients' quality of life but also impose a considerable burden on healthcare systems [1,2]. Although COPD progresses gradually, it is associated with a 5% all-cause mortality rate and increases the risk of lung cancer [3]. The COVID-19 pandemic had further exacerbated these challenges, as COPD patients experienced heightened disease severity and mortality following infection [4,5]. In 2015, the number of people worldwide with COPD was 174 million, with nearly 3.2 million COPD-related deaths [6]. A more recent figure reported by the World Health Organization indicates that COPD caused approximately 5% of all global deaths in 2021 (3.5 million individuals) [1]. Although the diagnosis of COPD needs to be confirmed using spirometry, several tests have been proposed to evaluate the severity of COPD, including pulmonary function testing, Global Initiative for Chronic Obstructive Lung Disease (GOLD), modified British Medical Research Council (mMRC) Questionnaire, COPD Assessment Test (CAT), and a 6-minute walk test [6]. Regarding the management of COPD, pharmacological treatment recommendations with the use of blood eosinophils as a biomarker have been proposed to prevent COPD exacerbations. Moreover, the use of inhaler therapy with maintenance is strongly recommended as a management goal [7]. However, prior research has indicated that there is a high prevalence of non-adherence to inhaler therapy among patients with COPD. For example, Cecere et al [8] reported that only 40% of their 184 COPD patients who were prescribed inhaler therapy were adherent.

In Taiwan, COPD affects between 2.48% and 9.5% of adults aged 40 years or older [9-11]. The disease leads to an average life expectancy loss of 11 years among individuals under 70, reflecting its substantial impact on public health [10]. Additionally, environmental factors such as high levels of fine particulate matter (PM2.5) and ozone (O_3) exacerbate symptoms and increase emergency room visits for COPD patients [10]. These challenges underline the critical importance of effective disease management, particularly through adherence to inhaled medications, which are the cornerstone of COPD treatment [2].

Measuring adherence to medication is a vital step in understanding patient behaviors and implementing effective interventions [12]. Among the existing tools, the Morisky Medication Adherence Scale (MMAS) is one of the most widely used instruments for assessing medication adherence across various chronic conditions, including COPD and asthma [13]. Its simplicity and strong psychometric properties make it a valuable tool in clinical and research settings [14]. The MMAS evaluates general medication-taking behaviors, such as forgetting to take medicine or altering treatment without consulting a healthcare provider, offering insights into overall adherence patterns [13].

However, the MMAS does not specifically address the unique aspects of inhaler use, which include proper technique, frequency of use, and patient–provider interactions [15]. Inhalers require specific skills and regular monitoring, as incorrect use can significantly reduce therapeutic effectiveness [16]. This limitation highlights the need for a more specialized tool to evaluate adherence specifically for inhaler use. To bridge this gap, the Test of Adherence to Inhalers (TAI) was developed by Plaza et al in 2016 [15]. The TAI has been found to be useful and feasible as evidenced in semi-structured interviews (by 11 experienced healthcare providers). More specifically, healthcare providers (each taking care of 129 to 2314 patients based on 180 working days a year) reported that over 80% of their suspicions regarding patient adherence were confirmed using the TAI. They further scored the system usability for the TAI, with a high score of 85.9 out of 100. Healthcare providers also commented that the TAI gave "insight into patients' adherence," was "easy-to-use," and was "visually attractive" [17].

Designed initially for Spanish-speaking populations with asthma and COPD, the TAI specifically evaluates adherence behaviors related to inhaler use [15]. Its unique structure, comprising patient and healthcare provider domains, provides comprehensive insights into the barriers and facilitators of inhaler adherence [15]. To date, the TAI has been validated in several cultural and linguistic contexts, including a Spanish population with asthma and COPD (in Spanish) [15], an Iranian population with COPD (in Persian) [18], a Malaysian population with asthma (in Bahasa Melayu) [19], and a mainland Chinese population (in simplified written Chinese) [20]. Although the TAI has been successfully validated in mainland China [20], the healthcare systems and cultural contexts in mainland China and Taiwan differ significantly [20,21], necessitating further adaptation for use in Taiwan. In mainland China, the healthcare system includes several subsystems based on residents' identities, often involving complex reimbursement structures and out-of-pocket expenses for inhalers [20]. Conversely, Taiwan's National Health Insurance program provides nearly universal coverage, ensuring that inhaled medications for COPD patients are fully reimbursed [21]. These systemic differences influence patient attitudes and behaviors toward medication adherence. For example, financial barriers commonly reported in mainland China may be less relevant in Taiwan, while the higher accessibility to healthcare in Taiwan could lead to distinct adherence patterns.

Cultural and linguistic differences further underscore the need for a localized adaptation of the TAI. Taiwan predominantly uses traditional Chinese characters, which differ linguistically and semantically from the simplified Chinese used in mainland China [22].

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Additionally, the healthcare interaction style in Taiwan tends to emphasize patient autonomy and shared decision-making compared to the more hierarchical doctor–patient dynamics often observed in mainland China [23]. These factors affect not only how patients perceive their treatment but also their responses to adherence-related questionnaires [23]. Consequently, the TAI requires adaptation and validation in traditional Chinese to ensure its relevance and accuracy for Taiwanese COPD patients. In other words, there is a need for a culturally adapted tool like the Chinese TAI in Taiwan, given the differences in healthcare systems and patient behaviors compared to other regions.

The present study aimed to translate and validate the TAI for use in Taiwan, focusing on its psychometric properties such as internal consistency, content validity, and factor structure. By addressing these contextual differences, the localized TAI has the potential to provide clinicians and researchers with a more precise tool to evaluate inhaler adherence and guide interventions for improving treatment outcomes. Therefore, the present cross-cultural study aimed to validate the Chinese translation of the 10-item TAI among 235 Taiwanese patients with COPD.

Material and Methods

Ethics Statement

The entire study procedure adhered to the Declaration of Helsinki and was approved by the Institutional Review Board of Chang Gung Medical Foundation (reference number: 202101706B0C601). Participants who agreed to participate were asked to provide written informed consent before completing the measures used in the present study.

Content Validity Procedure

Eight experts in related fields (including those with expertise of respiratory disease, pulmonary medicine, clinical pharmacology, and psychometrics/questionnaire development) were invited to evaluate the TAI item content. These experts were requested to focus on the relevance of the topic and the clarity of the questionnaire content. They then used a 4-point Likert scale, scoring from 1 (very inappropriate) to 4 (very appropriate) to evaluate the TAI items' relevance and clarity.

Study Design, Participants, And Data Collection Procedure

A cross-sectional study using convenience sampling was conducted to collect the data. The inclusion criteria for the participants were: (1) being aged 40 years or above; (2) having a diagnosis of COPD (based on post-bronchodilator FEV1 [forced expiratory volume in 1 second)]/FVC [forced vital capacity] <70%) (ICD-10 [International Statistical Classification of Diseases and Related Health Problems 10th Revision]: J44-J49); and (3) using at least 1 inhaler regularly (at least once a day). The participants who did not want to participate or those with cognitive problems were excluded. All participants were recruited with the assistance of a regional hospital in Chiayi (a southern Taiwan region). A well-trained research assistant and a respiratory therapist with 8 years of clinical experience together interviewed the participants in person. Before the interview, the research assistant and respiratory therapist introduced the study to the participants regarding the study purpose and the rights of participants. They also checked that the participants had sufficient ability to complete the questionnaires.

Main measure: Test of the Adherence to Inhalers (TAI)

The TAI contains 12 items assessing the adherence of inhaler use among patients who are prescribed to use inhalers regularly (eg, patients with asthma or COPD) [15]. The 12 items are grouped into 2 factors: patient domain (the first 10 items) and healthcare professional domain (the last 2 items). The first 10 items are rated using a 5-point Likert scale (ranging from 1 [All] to 5 [None or Never]), with a higher score indicating better adherence. A sample item is "*Do you forget to use inhalers?*" The last 2 items are rated using a dichotomous scale (1 [No or with critical mistakes] or 2 [Yes or Without critical mistakes]). The present study focused on patient-reported outcome measure and therefore only examined the psychometric properties of the first 10 items. Moreover, the TAI developers proposed using the full score to indicate an adherent patient (scoring 50).

Because there are some differences between mainland China and Taiwan regarding the healthcare system, the Chinese TAI was evaluated by several Taiwanese experts (including experts in thoracic medicine, respiratory therapy, psychometrics, and questionnaire development) to ensure item appropriateness and content validity.

Other Measures

Demographics and Clinical Features

During the interview, the participants were asked to report their age (in years), number of comorbidities, cigarette smoking status (never, former smoker, or current smoker), educational level (primary school or below, high school or above), and illness duration. The interviewers also recorded the participant's sex and checked their inhaler technique correctness (using their inhalers correctly).

COPD Severity

The following measures were used to assess the participants' COPD severity on enrollment: (1) mMRC: 5 levels ranging from

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0 (get breathless with strenuous exercise) to 4 (too breathless to leave the house or breathless when dressing/undressing) [7]; (2) CAT: 8 items rated using a 0-5 scale (eg, "*I never cough*" [score 0] to "*I cough all the time*" [score 5]) [24]; and (3) Disease severity determined using the criteria of the GOLD 2020 guidelines [25].

External Criterion on Mindset of Medicine Use

One item adapted from the MMAS [13] was used to assess if the TAI can distinguish between adherent and non-adherent patients with COPD. More specifically, the item asked the participants regarding their agreement on the statement "*Don't take medicine when there are no symptoms*" with a score between 1 (strongly disagree) and 5 (strongly agree).

Data Analysis

The item content validity index (I-CVI) for each item was calculated using the number of experts who scored 3 or 4 minus half the number of the total experts (4 in the present study), then divided by half the number of the total experts. The scale's content validity index (S-CVI) was then calculated by summing the I-CVIs and dividing them by the number of items. An I-CVI and an S-CVI larger than 0.7 indicate good content validity [26].

For the quantitative psychometric testing, the present sample was first analyzed using descriptive statistics (including means and standard deviations [SDs]) to summarize their demographics and clinical characteristics. Then, the TAI items were analyzed using descriptive statistics to examine the item properties. Parallel analysis (PA) with 100 simulated samples was used to help decide the number of factors to use for the TAI. More specifically, the eigenvalue derived from the present sample was compared with the eigenvalue of the 95% upper limit of the simulated samples. If the eigenvalue from the present sample is larger than that of the 95% upper limit of the simulations, the factor is considered to be real [27,28]. After deciding the number of factors to use for the TAI, exploratory factor analysis (EFA) with the principal axis (PA) factoring extraction method was used to obtain the factor loadings for TAI items. A factor loading larger than 0.3 indicates acceptable [29].

Additionally, internal consistency of the TAI was calculated using Cronbach's α for every factor obtained from the PA and EFA results. Cronbach's α larger than 0.7 indicates acceptable internal consistency [29]. Item-to-total correlations were computed for every TAI item with a value larger than 0.3, indicating acceptable [30]. Lastly, the participants were classified into 2 groups: an adherent group with TAI summed score of 50 or above (using all 10 items), and a non-adherent group with TAI summed score of 49 or below [15]. The following features were compared between the 2 groups using independent *t* tests with Cohen's *d*: agreement on the statement *"Don't take medicine when there are no symptoms"*; age; number of comorbidities; CAT score; mMRC score; illness duration; and technique correctness. A Cohen's *d* >0.2 indicates small or above effect [31]. When the adherent group had a significantly larger score than non-adherent group with a Cohen's *d* >0.2, the TAI cutoff score was supported to effectively distinguish patients with good adherence from those without good adherence. All statistical analyses were conducted using IBM SPSS 20.0 (IBM Corp., Armonk, NY).

Table 1. Content validity of the Test of Adherence to Inhaler (TAI), Chinese version (N=235).

Item number	I-CVI for relevance	I-CVI for clarity
TAI1	1	1
TAI2	1	1
TAI3	1	1
TAI4	1	1
TAI5	1	1
TAI6	1	1
TAI7	1	1
TAI8	1	1
TAI9	1	1
TAI10	0.75	0.875

I-CVI – item content validity index; TAI – Test of Adherence to Inhaler. The scale content validity index of the TAI was 0.975 (relevance) and 0.988 (clarity).

Sample Size Justification

The required sample size of the present study was determined to be over 220, according to the rule of thumb calculation for EFA, the primary analysis used in the present study. More specifically, the calculation suggests *n* being 200+2*number of items for response scales are ordinal scale [32]. Therefore, the calculation was 200+2*10 (because 10 TAI items were used for EFA)=220. We enrolled 235 participants.

Results

Content Validity and Participants' Characteristics

For the content validity, the S-CVI of the TAI was excellent. Specifically, the S-CVI for item relevance was 0.975 and 0.988 for word clarity. In addition, all items had good I-CVI (**Table 1**). After ensuring the content validity of the TAI, the psychometric

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Table 2. Characteristics of the participants with chronic obstructive pulmonary disease (N=235).

Variable	Mean (SD) or n (%)	Range
Age (in years)	72.18 (10.19)	44 to 96
Sex (male)	220 (93.6)	
No. of comorbidities	1.11 (1.04)	0 to 5
Cigarette smoking status		
Never	37 (15.7)	
Former smoker	141 (60.0)	
Current smoker	57 (24.3)	
Educational level		
Primary school or below	139 (59.1)	
High school or above	96 (40.9)	
GOLD grade		
GOLD 1	83 (35.3)	
GOLD 2	95 (40.4)	
GOLD 3	41 (17.4)	
GOLD 4	16 (6.8)	
COPD group		
A	169 (71.9)	
B	49 (20.9)	
C	5 (2.1)	
D	12 (5.1)	
CAT Score		(0-40)
CAT <10	181 (77.0)	
CAT ≥10	54 (23.0)	
mMRC Score		(0-4)
mMRC <2	157 (66.8)	
mMRC ≥2	78 (33.2)	
Illness duration (year)	4.40 (2.67)	0.1 to 19.6
Technique correctness (%)	98.35 (5.85)	62 to 100

GOLD – Global Initiative for Chronic Obstructive Lung Disease; COPD – chronic obstructive pulmonary disease; CAT – the COPD assessment test; mMRC – Modified Medical Research Council Dyspnea Scale.

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Table 3. Item properties of the Test of Inhaler Adherence.

TAI item	Mean	SD	Skewness	Kurtosis	Loading	ITC
TAI1	4.86	0.38	-2.75	7.27	0.57	0.55
TAI2	4.74	0.58	-2.23	4.28	0.72	0.67
TAI3	4.92	0.35	-4.77	22.31	0.70	0.66
TAI4	4.87	0.43	-3.50	11.43	0.68	0.61
TAI5	4.95	0.24	-5.01	27.15	0.56	0.51
TAI6	4.97	0.20	-6.61	48.11	0.52	0.47
TAI7	4.95	0.30	-7.34	59.02	0.40	0.35
TAI8	4.89	0.43	-3.79	13.23	0.80	0.71
TAI9	4.95	0.27	-6.15	39.18	0.57	0.52
TAI10	4.98	0.16	-10.35	115.20	-0.02	-0.02

TAI – Test of the Adherence to Inhaler; ITC – item-to-total correlation. Cronbach's α=0.82 (all 10 TAI items) and 0.84 (without TAI10 item); factor loadings were derived from the exploratory factor analysis with extraction of principal axis factoring method.

Table 4. Parallel Analysis of the Test of Inhaler Adherence.

Factor #	Eigenvalue from the present data	Mean eigenvalue from 100 simulated samples	Eigenvalue at 95% upper limit from 100 simulated samples
1	4.06	1.34	1.44
2	1.09	1.23	1.30
3	1.02	1.15	1.20
4	0.90	1.08	1.14
5	0.79	1.02	1.06
6	0.68	0.96	1.00
7	0.54	0.90	0.94
8	0.37	0.84	0.89
9	0.30	0.77	0.83
10	0.26	0.70	0.76

performance of the TAI among patients with COPD was evaluated. Among the 235 participants (there were no missing values from the 235 participants), the majority were males (n=220; 93.6%) with a mean age of 72.18 years (SD=10.19). Most of the participants were former cigarette smokers (n=142; 60.0%) or current smokers (n=57; 24.3%). More than half of the participants had only completed primary school education or below (n=139; 59.1%). On average, the participants had COPD for 4.40 years (SD=2.67; ranging from 0.1 to 19.6 years). The present sample had a very high level of correctness in using inhalers (mean=98.35 [SD=5.85]; ranging from 62 to 100). **Table 2** reports other features of the present sample.

Item Properties and Internal Consistency of the TAI

The item properties of the TAI are presented in **Table 3**. In brief, all TAI item scores were skewed to the response of "None" (score 5). Therefore, all TAI items had relatively high skewness (absolute value >2.23) and kurtosis (>7.27). Moreover, TAI Item 10 had the highest skewness (10.35) and kurtosis (115.20). The 10 items were found to be embedded in a single factor, as shown by the PA results (**Table 4**). Only the first eigenvalue derived from the present data (4.06) was larger than that of the 95% upper limit of the 100 simulated samples (1.44). Therefore, the factor loadings of the items were computed using a single-factor solution from the EFA. All items had acceptable factor loadings (between 0.40 and 0.80), except for TAI Item 10 (-0.02). Similarly, item-to-total correlations of the TAI items were acceptable (between

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Table 5. Feature comparisons between adherent and non-adherent participants (N=235).

Variable	Mean (SD)		t (*P* value)	Cohen's d
	Adherent (n=170)	Non-adherent (n=65)		
Agreement on "*Don't take medicine when there are no symptoms*"	0.41 (0.87)	0.77 (1.10)	2.35 (0.02)	**0.36**
Age (in years)	73.00 (10.32)	70.05 (9.62)	2.00 (0.047)	**0.30**
Number of comorbidities	1.14 (1.00)	1.05 (1.15)	0.59 (0.56)	0.08
COPD Assessment Test (CAT) score	6.38 (4.89)	6.43 (5.67)	0.07 (0.94)	0.01
Modified Medical Research Council Dyspnea Scale (mMRC) score	1.50 (1.36)	1.37 (1.28)	0.67 (0.50)	0.10
Illness duration (in years)	4.38 (2.65)	4.46 (2.72)	0.21 (0.83)	0.03
Technique correctness	98.79 (4.88)	97.19 (7.80)	1.88 (0.06)	**0.25**

Cohen's *d* >0.2 are in bold, indicating small or above.

0.35 and 0.71), except for TAI Item 10 (-0.02). Moreover, the internal consistency of the TAI was satisfactory (α=0.82 using all 10 TAI items; 0.84 excluding TAI Item 10).

TAI-Defined Adherent and Non-Adherent Group Comparisons

The TAI score was then used to classify the participants into an adherent group (n=170) and a non-adherent group (n=65) according to the sum score of the 10 TAI items. The 2 groups had significant differences in response to the statement "*Don't take medicine when there are no symptoms*" (mean=0.41 [SD=0.87] for the adherent group and 0.77 [SD=1.10] for the non-adherent group; *P*=0.02; Cohen's *d*=0.36), and age (mean=73.00 years [SD=10.32] for the adherent group and 70.05 years [SD=9.62] for the non-adherent group; *p*=0.047; Cohen's *d*=0.30). Moreover, the 2 groups had a marginally significant difference in technique correctness (mean=98.79 [SD=4.88] for the adherent group and 97.19 [SD=7.80] for the non-adherent group; *P*=0.06; Cohen's *d*=0.25). No significant differences were found between the 2 groups in the number of comorbidities, CAT score, mMRC score, or illness duration (**Table 5**).

Discussion

With the use of content validity, the present study ensured the appropriateness of the Chinese version of TAI among Taiwanese patients with COPD. The content validity of the TAI in the present study was found to be satisfactory and comparable to the findings of previous research [26]. In addition to satisfactory content validity, the present study found that the Chinese version of TAI contained a one-factor structure, and good internal consistency. Moreover, the adherent group and the non-adherent group defined using the TAI score efficiently identified score differences in agreement of the statement *"Don't take medicine when there are no symptoms"*. Moreover, similar to the internal consistency found in the previous TAI psychometric evaluation studies (α=0.843 in mainland China [20]; 0.873 in Spain [15]; 0.986 in Iran [18]; and 0.823 in Malaysia [19]), the present study demonstrated satisfactory internal consistency of the TAI α=0.82). However, unlike previous studies [15,18-20], Item 10 of the TAI in the present study was poor (factor loading=-0.02; item-to-total correlation=-0.02).

Although TAI Item 10 did not fit with the entire TAI, the remaining 9 TAI items had good factor loadings and item-to-total correlation and comprised a single factor. Using the cutoff proposed by Plaza et al [15], the TAI-defined adherent group had significantly lower scores in agreeing with the statement "*Don't take medicine when there are no symptoms*" than the TAI-defined non-adherent group. Moreover, the TAI-defined adherent group were significantly older than the TAI-defined non-adherent group. Additionally, the TAI-defined adherent group had marginally significantly better inhaler technique correctness than the TAI-defined non-adherent group.

The misfit of TAI Item 10 may result from Taiwan's unique health insurance situation. The Taiwan government launched the National Health Insurance program in 1993, and this insurance program covers over 99% of the Taiwanese population for their basic healthcare needs [21,33]. The inhalers for patients with COPD are fully reimbursed by the Taiwan National Health Insurance program. Therefore, patients with COPD in Taiwan do not encounter the situation described in TAI Item 10 ("*Do you stop taking your inhalers because you have difficulties paying for them?*"). Consequently, this item cannot be used to assess adherence to inhaler use in the Taiwanese context.

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Although TAI Item 10 was not a good item in the Taiwanese healthcare context, the entire TAI effectively distinguished participants in relation to the statement "*Don't take medicine when there are no symptoms*". This finding aligns with previous research [15]. Moreover, the TAI distinguished participants with better technique skills in inhaler use from those with poor technique skills. This can be explained by the Skill Acquisition Theory [34], which posits that adherent patients had more practice in using inhalers than non-adherent patients, resulting in their better technique skills.

The present study had some limitations. First, included patients had relatively mild COPD, and all were recruited from a single hospital in Taiwan. Therefore, the representativeness of the present sample may restrict the generalizability of the findings to other Taiwanese populations (eg, individuals with COPD living in other Taiwanese cities). Second, the present study did not assess the test-retest reliability of the TAI. Therefore, the reproducibility of the TAI is unknown among Taiwanese patients with COPD. Third, although the present study used a single item as the external criterion to assess if the TAI effectively distinguished between adherent and non-adherent patients, the single item was self-reported [13]. Therefore, the possibility of single-rater bias exists. Due to this limitation, it was impossible for the present study to examine sensitivity and specificity of the Chinese TAI. Future studies may want to use external criteria with more objective measures (eg, observations from experienced therapists) to reassess the ability of the TAI to distinguish different levels of adherence. Lastly, the TAI used in the present study is a patient-reported outcome instrument, and the biases of social desirability and memory recall cannot be entirely prevented.

Conclusions

Findings from this study demonstrated that the Chinese version of the TAI effectively assesses inhaler adherence among Taiwanese COPD patients, exhibiting very good internal consistency, excellent content validity, and a single-factor structure. Moreover, the TAI effectively classifies patients into adherent and non-adherent groups, providing valuable insights for clinical decision-making. In other words, the translated Chinese TAI assessing inhaler adherence among Taiwanese patients with COPD effectively helps them to identify their inhaler adherence. Researchers and healthcare providers can use the translated TAI to monitor inhaler adherence of for patients with COPD in Taiwan.

Department and Institution Where Work Was Done

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