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Psychometric properties of the Insomnia Severity Index for people with chronic obstructive pulmonary disease

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ABSTRACT

Objective/background: Insomnia is one of the most commonly reported symptoms among people with chronic obstructive pulmonary disease (COPD). Prior research evaluated the psychometric properties of the Insomnia Severity Index (ISI) with various populations, but no studies have examined the measurement properties of the instrument in the COPD population. This study aimed to determine the reliability and validity of the ISI for the COPD population.

Patients/methods: This study included 96 people with COPD and insomnia. As psychometric properties, the ISI's internal consistency, factor structure, and criterion validity were examined with this sample. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were used to evaluate construct validity. Correlations between scores for the ISI and for measures of depression, anxiety, fatigue, and dyspnea were examined to determine criterion validity.

Results: The Cronbach's alpha value for the ISI was 0.79, indicating good internal consistency. In the EFA, a single ISI factor with an eigenvalue of 3.19 accounted for 45.6% of the variance. CFA indicated adequate construct validity, and interference of sleep problems with daytime functioning and level of distress caused by sleep difficulties showed the highest factor loadings (both 0.78). Criterion validity was supported by significant, weak to moderate correlations between scores for the ISI and for measures of depression, anxiety, fatigue, and dyspnea.

Conclusions: The results provide evidence that the ISI has good reliability and validity for measuring insomnia severity in the COPD population.

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1. Introduction

Chronic obstructive pulmonary disease (COPD) is a chronic progressive airflow obstruction and is the third leading cause of death worldwide [1,2]. In individuals with COPD, sleep can have a negative impact on the respiratory system, resulting in nocturnal oxygen desaturation and in suppressed cough that leads to excessive production in the early morning [3,4]. Moreover, nocturnal COPD symptoms (i.e., cough, dyspnea, mucus production, and oxygen desaturation), comorbid anxiety and depression, smoking, and use of COPD medications (e.g., theophylline) are known to be significantly associated with poor sleep quality [5,6].

Insomnia is reported by 27%–70% of the COPD population, depending on sleep characteristics such as difficulty falling asleep and staying asleep, frequent nocturnal awakenings, low sleep quality and quantity, and impaired daily functioning [5,7–9]. In general, insomnia is defined as a sleep initiation or maintenance problem experienced despite adequate opportunity and circumstances for sleep and its daytime consequences [10]. COPD-related symptoms such as dyspnea and hypoxia are significant predictors

Abbreviations: AVE, average variance extracted; CFA, confirmatory factor analysis; CFI, comparative fit index; COPD, chronic obstructive pulmonary disease; CR, construct reliability; CRQ, Chronic Respiratory Disease Questionnaire; EFA, exploratory factor analysis; HADS, Hospital Anxiety and Depression Scale; ISI, Insomnia Severity Index; KMO, Kaiser-Meyer-Olkin; PARAN, parallel analysis for principal component analysis and factor analysis; PCA, principal component analysis; PROMIS, Patient-Reported Outcomes Measurement Information System; RMSEA, root mean square error of approximation; SD, standard deviation; SRMR, standardized root mean square residual; TLI, Tucker-Lewis index.

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of insomnia [5], which can negatively affect COPD exacerbations [11], daytime functioning [7], physical activities [12], cognitive function [13], COPD self-management behaviors [14], quality of life [11,15], and health outcomes [5], and respiratory-related emergency service utilization [11]. Furthermore, insomnia in people with COPD has been significantly associated with physical and psychological symptoms such as anxiety, depression, and fatigue [16]. However, despite the detrimental impacts of insomnia in people with COPD, insomnia remains under-recognized in this population.

The Insomnia Severity Index (ISI) is the most widely used self-report measure for insomnia and has been applied across a range of populations. This instrument assesses the severity of both nighttime and daytime components of insomnia, including self-reported insomnia symptoms (e.g., daytime fatigue, sleep satisfaction, and functional impairment) [17]. The ISI is a useful instrument for insomnia screening, diagnosis, or treatment and for research when insomnia is an outcome variable [18]. As a brief screening tool for insomnia, the ISI is particularly useful for capturing the diagnostic criteria for insomnia outlined in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) and the International Classification of Sleep Disorders (ICSD), and it can measure the degree of impairment and emotional distress related to insomnia [18]. Moreover, the ISI is the most frequently used measure for the outcome variable in insomnia studies because of its sufficient reliability, validity, and sensitivity for detecting treatment response [18]. Additionally, the ISI is an efficient tool with a low response burden because it has a small number of items compared to other insomnia questionnaires. Due to its brevity, it has been used to identify insomnia cases (e.g., prevalence rate or odds ratio) in epidemiological research [19].

Given these strengths, ISI has been productively employed in both the clinical setting and sleep research (e.g., randomized controlled trials) with various populations—people with insomnia [18]; people in the community [19,20]; primary care populations [21]; patients with cancer [22], pain [23], and sickle cell disease [24]; adolescents [25]; shift workers [26]; and cancer survivors [27]. However, as prior ISI psychometric analyses suggested that the dimensionality of the instrument varied across populations, evaluation of the ISI's factor structure in a specific population can provide evidence for the instrument's applicability in a particular group to assess insomnia [27].

Despite its high prevalence in people with COPD, insomnia remains clinically under-recognized and under-researched, making it a priority area for further study [3]. Psychometric evaluation of the ISI among people with COPD can facilitate use of this instrument to screen for and assess insomnia in this population. In addition, ISI scores of people with COPD can differ from those of people with other chronic diseases or health conditions because their physical and psychological vulnerabilities to insomnia may result in unique insomnia characteristics. However, no studies have examined the measurement properties of the ISI in the COPD population. Therefore, this study aimed to determine the reliability and validity of the ISI for people with COPD.

2. Material and methods

2.1. Participants

This study involved secondary analysis of data collected at baseline during a randomized controlled trial of behavioral therapy for insomnia. Subjects were asked to complete measures of insomnia, fatigue, dyspnea, anxiety, and depression at baseline. Based on study inclusion and exclusion criteria, 96 people with COPD and insomnia were included. The inclusion criteria of the study were as follows: people (1) with mild to very severe COPD based on COPD Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines [28]; (2) with self-reported insomnia defined by an ISI score of at least 8; (3) aged ≥45 years with no uncontrolled major health problems; and (4) clinically stable at the time of study enrollment without major COPD exacerbation within the previous 2 months. The exclusion criteria for the study were as follows: people with (1) evidence of restrictive lung disease or asthma; (2) a pulse oximetry (SaO2) reading of <90% at rest or of <85% at night for >5 min; (3) evidence of a major sleep disorder other than insomnia; (4) hypnotic drug use; (5) acute respiratory infection within the previous 2 months; (6) a potentially debilitating disease (e.g., cancer, congestive heart failure, kidney disease, or liver failure); (7) a self-reported current diagnosis of major depression or psychiatric disease or a Hospital Anxiety and Depression Scale (HADS) depression score >11; or (8) currently participating in pulmonary rehabilitation.

2.2. Measures

2.2.1. Insomnia Severity Index

The ISI assesses the nature, severity, and impact of insomnia during the previous 2 weeks. Its seven items address (1) difficulty falling asleep, (2) difficulty staying asleep, (3) problems waking too early, (4) sleep dissatisfaction, (5) interference of sleep problems with daytime functioning, (6) noticeability of sleep difficulties to others, and (7) level of distress caused by sleep difficulties. Each item is rated using a 5-point Likert scale ranging from 0 (none) to 4 (very severe). Total scores range from 0 to 28, and higher scores indicate greater insomnia severity [17,19].

2.2.2. Hospital Anxiety and Depression Scale

The HADS is used to measure anxiety and depression. It consists of 14 items divided into the two subscales of HADS-anxiety (HADS-A) and HADS-depression (HADS-D). Both sets of items are rated on a 4-point scale (0–3), with higher scores indicating higher levels of anxiety and depression [29].

2.2.3. Chronic Respiratory Disease Questionnaire

The Chronic Respiratory Disease Questionnaire (CRQ) consists of 20 items across four domains—dyspnea (5 items), fatigue (4 items), emotional function (7 items), and mastery (4 items). It has been widely used to measure health-related quality of life in people with COPD. For the purposes of this study, data collected using the CRQ-Dyspnea (CRQ-D) and CRQ-Fatigue (CRQ-F) subscales were used. The CRQ-D has five items addressing various activities and assesses the degree of dyspnea experienced during those activities. Respondents rate their experience on a 7-point scale ranging from 1 (extremely short of breath) to 7 (not at all short of breath). Lower scores indicate greater dyspnea severity. The CRQ-F consists of four items rated on a 7-point scale ranging from 1 (all of the time) to 7 (none of the time). Lower scores indicate greater fatigue severity [30].

2.2.4. Patient-Reported Outcomes Measurement Information System

The computerized adaptive testing (CAT) versions of three Patient-Reported Outcomes Measurement Information System (PROMIS) scales were used to measure anxiety, depression, and fatigue. The anxiety item bank (PROMIS-A) measures self-reported fear, anxious misery, hyperarousal, and somatic symptoms related to arousal [31]. The depression item bank (PROMIS-D) assesses self-reported negative mood, views of self, and social cognition as well

as decreased positive affect and engagement [31]. Finally, the fatigue item bank (PROMIS-F) measures fatigue experience and fatigue interference with daily life and function [32]. The scores from PROMIS-A, PROMIS-D, and PROMIS-F are converted into standardized T scores (mean = 50, standard deviation [SD] = 10), with higher scores indicating higher levels of anxiety, depression, and fatigue, respectively.

2.3. Ethical approval

Study approval was obtained from the Institutional Review Board of the University of Illinois at Chicago.

2.4. Statistical analysis

Data were analyzed using Stata/IC 16.1 (StataCorp, College Station, Texas, USA). Data quality and missing data were assessed using descriptive statistics (means, SDs, frequencies, and percentages). No missing data were identified for the variables included in this study. All tests were two-tailed, and a type I error rate of $\alpha < 0.05$ was considered statistically significant.

The reliability of the ISI was determined by estimating internal consistency using Cronbach's alpha. The relationship of each ISI item to the total instrument score was examined using item-total correlations.

The factorial validity of the ISI was evaluated using exploratory factor analysis (EFA). The Kaiser-Meyer-Olkin (KMO) value and Barrett's Test of Sphericity were used to determine that EFA could be applied. Principal component analysis (PCA) was used to determine the number of factors to be retained for the EFA based on eigenvalues >1 [33], which represents the variance explained by each factor as well as the coherence and interpretability of the factors. Parallel analysis for PCA and factor analysis (PARAN) was also used to determine the number of factors based on adjusted eigenvalues >1. Factor loadings were estimated and compared with criteria indices [34].

Once the number of factors was identified, confirmatory factor analysis (CFA) was carried out to evaluate the construct validity of the ISI. The purpose of CFA is to determine whether an EFA-derived model provides sufficient goodness-of-fit, which represents how the estimated model fits the data. Fit statistics were evaluated using four fit indices: the comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) [35]. The CFI and TLI compare the fit of the hypothesized model with that of an independent model, which refers to a model in which the variables are assumed to be independent of one another [36]. For both the CFI and TLI, values ≥ 0.9 indicate an acceptable fit [36]. RMSEA represents the degree of misfit per degree of freedom, and a RMSEA value ≤ 0.1 indicates an acceptable model fit [37]. Lastly, SRMR represents the square root of the difference between the residuals of the sample covariance matrix and the hypothesized model, and an SRMR value ≤ 0.08 indicates an acceptable fit [36].

If model fit indices did not meet criteria thresholds but were close to the thresholds, a modification index was used to determine whether model re-specifications were needed. The modification index provides an estimate of potential improvements in model fit that would result from adding a given relationship, including a direct path or correlation [38]. If the modification index is ≥ 10, refinements can be made to the hypothesized model.

The criterion validity (i.e., the extent to which a scale correlates with another scale at the same point in time) of the ISI was determined using Pearson's coefficients between scores for the ISI and for measures of depression, anxiety, fatigue, and dyspnea.

3. Results

3.1. Participant characteristics

Among the 96 participants, 59.4% (n = 57) were men, and 76% (n = 73) were African American. The mean age of the participants was 64 years (SD = 8.5). People with mild, moderate, severe, and very severe COPD accounted for 26% (n = 25), 51% (n = 49), 15.6% (n = 15), and 7.3% (n = 7) of the sample, respectively. The mean ISI score was 16.1 (SD = 4.5), with scores ranging from 6 to 27.

3.2. Reliability

The Cronbach's alpha value for the ISI was 0.79, suggesting that the instrument has good internal consistency. The item-total correlations of the ISI ranged from 0.51 to 0.80 (mean = 0.67), indicating that all items contribute to the ISI total score. The items “interference of sleep problems with daytime functioning” and “level of distress caused by sleep difficulties” showed the highest item-total correlations (both 0.80), while the items “problems waking too early” and “sleep dissatisfaction” showed lower correlations (0.51 and 0.57, respectively).

3.3. Factor structure

Both PCA and PARAN identified only one factor in the ISI with an eigenvalue greater than 1; its eigenvalues were 3.19 and 2.83, respectively. This one factor accounted for 45.6% of the variance. The KMO value was 0.73 and the results of Barrett's Test of Sphericity were significant (p<.001), indicating that factor analysis can be applicable. The factor structure and loadings of the seven ISI items are shown in Table 1.

Based on the single-factor solution of the EFA, a CFA was carried out. The CFA fit indices indicated that SRMR was acceptable (0.08); other three indices were close to but did not meet standard criteria (CFI = 0.84, TLI = 0.76, RMSEA = 0.16). These results indicated that the latent structure was missing some significant relationships and that minor model adjustments were needed [39].

A modification index was used to examine how much model fit would be improved by re-specifying the model. A relatively high score (modification index = 16.61) was found between the residuals for “sleep dissatisfaction” and “noticeability of sleep difficulties to others.” The correlation coefficient was −0.55, indicating a negative correlation between the residuals of these two items. After this covariance was added to the model, all four fit indices (CFI = 0.94, TLI = 0.90, RMSEA = 0.10, SRMR = 0.07) indicated that model fit was acceptable.

The construct validity of the ISI was evaluated based on the coefficients of the CFA. The values of the factor loadings, average variance extracted (AVE), and construct reliability (CR) coefficient are shown in Table 2. All factor loadings were statistically significant (all p's < 0.001). The standardized coefficients (i.e., factor loadings) for the observed variable comprising Factor 1 ranged from 0.31 to 0.78, exceeding the minimum value of 0.32 [35] except for one item (ISI3 = 0.31) that was close to the minimum value (Fig. 1). This result suggested that all ISI items were significantly related to the factor, indicating good construct validity. Moreover, the AVE for the factor was 0.61, suggesting good convergent validity. The CR coefficient was 0.90, indicating good reliability.

3.4. Criterion validity

Correlation coefficients were obtained between ISI scores and scores for instruments measuring theoretically related, albeit different, constructs such as depression, anxiety, fatigue, and

Table 1
Factor structure and loadings of seven ISI items for people with COPD (n = 96).

Variable	Item	Factor 1
ISI7	Distress caused by sleep difficulties	0.81
ISI5	Interference of sleep difficulties with daytime functioning	0.81
ISI6	Noticeability of sleep problems to others	0.71
ISI1	Difficulty falling asleep	0.68
ISI2	Difficulty staying asleep	0.65
ISI4	Sleep dissatisfaction	0.55
ISI3	Problems waking too early	0.46
Eigenvalue		3.19
% of variance		45.62
Cumulative % of variance		45.62

Note. COPD = chronic obstructive pulmonary disease, ISI=Insomnia Severity Index. Kaiser-Meyer-Olkin (KMO) = 0.73, Barlett's $\chi^2 = 207.02$ ($p<.001$).

Table 2
ISI validity based on confirmatory factor analysis.

Factor 1	Standardized estimate	AVE	CR
Factor 1 → ISI 1	0.56	0.61	0.90
Factor 1 → ISI 2	0.48		
Factor 1 → ISI 3	0.31		
Factor 1 → ISI 4	0.55		
Factor 1 → ISI 5	0.78		
Factor 1 → ISI 6	0.74		
Factor 1 → ISI 7	0.78		

Note. AVE = average variance extracted, CR = construct reliability, ISI=Insomnia Severity Index.

dyspnea (Table 3). The ISI showed a weak and positive correlation with HADS-D and moderate and positive correlations with PROMIS-D, HADS-A, PROMIS-A, and PROMIS-F ($p<.05$). As lower CRQ-F and CRQ-D scores indicate higher fatigue and dyspnea, respectively, the ISI showed weak to moderate and negative correlations with the CRQ-F and CRQ-D ($p<.05$).

4. Discussion

To our knowledge, this is the first study to evaluate the reliability and validity of the ISI among people with COPD. We found that the ISI is a reliable and valid instrument for assessing insomnia severity in the COPD population. The mean Cronbach's alpha value for the ISI ($\alpha = 0.79$) indicates good internal consistency. In addition, the item-total correlations for the ISI show that all items contribute to the ISI total score.

To date, the ISI has been found to have adequate reliability across various other populations in terms of internal consistency, inter-rater reliability, and test-retest reliability. For example, the ISI showed good internal consistency ($\alpha = 0.87–0.92$) for healthy people [19]. In the medical setting, the ISI has shown a wide range of internal consistency reliability ($0.61 \leq \alpha \leq 0.92$) for patients with chronic illnesses [27]. For people with insomnia, the ISI demonstrated high internal consistency ($\alpha = 0.92$) [21], and for cancer survivors, the ISI showed good internal consistency ($\alpha = 0.73$) [27]. As to inter-rater and test-retest reliability, the ISI showed excellent inter-rater reliability among people in primary care [21] and moderate test-retest reliability when administered twice with a 2-week interval among Lebanese adolescents [25]. No studies have identified the inter-rater, intra-rater, or test-retest reliability of the ISI among people with COPD, and thus future studies should examine these types of reliability with repeated measures to determine the ISI's applicability in this population.

Findings regarding the ISI's factor structure indicate that the ISI is a valid instrument for assessing insomnia severity in the COPD population. PCA revealed that all ISI items capture one factor of insomnia, explaining 45.6% of the total variance. One notable finding of the CFA suggested that the ISI should be modified, as a negative correlation was found between the residuals of two items—"sleep dissatisfaction" and "noticeability of sleep difficulties by others." In this regard, qualitative studies have reported that in some cases, people with COPD experienced social embarrassment and stigmatization due to dyspnea, disruptive cough or sputum, use of inhalers or supplemental oxygen, and smoking history as well as physical limitations [40–42]. Specifically, dyspnea, cough, and sputum are likely to raise the possibility of contagion [42], which may make it difficult for people with COPD to reveal their disease to others. For the same reason, people with COPD having severe pulmonary symptoms are less likely to want to be viewed as sick and a burden to others [42]. Similarly, people with COPD who are dissatisfied with their sleep patterns may be reluctant to divulge their sleep problems to others due to stigmatization. Further qualitative validation is warranted to examine the pattern of the two above-mentioned ISI

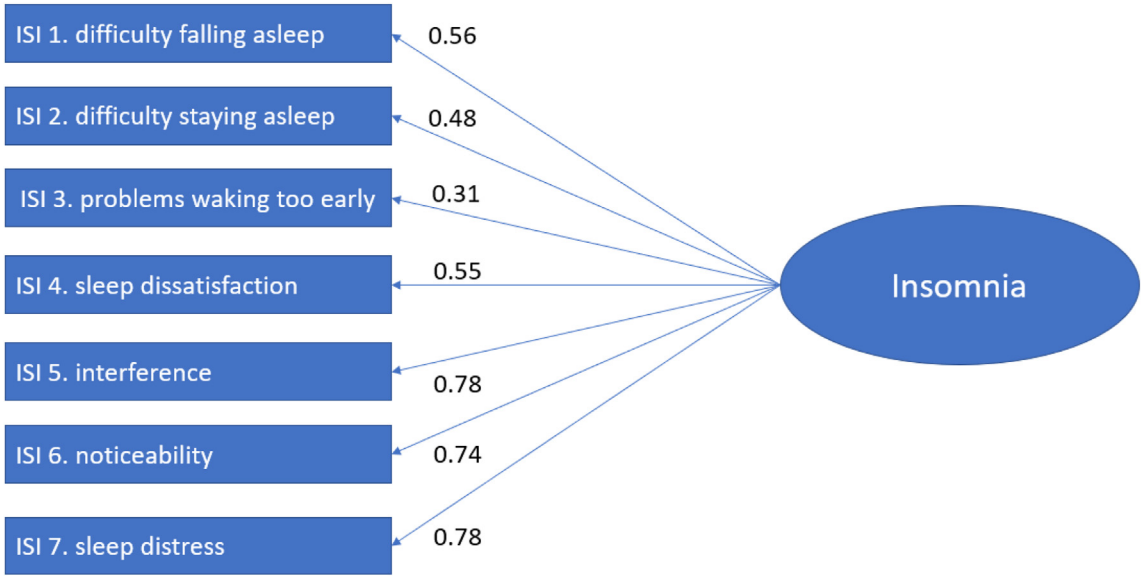

Fig. 1. Factor structure of Insomnia Severity Index based on confirmatory factor analysis.

Table 3
Correlations between ISI and instruments measuring other constructs.

Construct	Measure	Correlation coefficient
Depression	HADS-D	0.29*
	PROMIS-D	0.34*
Anxiety	HADS-A	0.32*
	PROMIS-A	0.33*
Fatigue	CRQ-F	−0.45*
	PROMIS-F	0.35*
Dyspnea	CRQ-D	−0.24*

Note. CRQ-D: Chronic Respiratory Disease Questionnaire-Dyspnea, CRQ-F: CRQ-Fatigue, HADS-A: Hospital Anxiety and Depression Scale-Anxiety, HADS-D: HADS-Depression, ISI=Insomnia Severity Index. PROMIS-A: Patient-Reported Outcomes Measurement Information System-Anxiety, PROMIS-D: PROMIS-Depression, PROMIS-F: PROMIS-Fatigue, *p<.05.

responses, which may produce meaningful findings that contribute to new knowledge about the COPD population.

With model modification, CFA showed that all ISI items are significantly related to the one factor identified, indicating good construct validity. Factor loadings for the observed variable (insomnia) ranged from 0.31 to 0.78, all of which were statistically significant. The factor loading of the item “problems waking too early” was 0.31, which was below but close to the minimum value of 0.32 [34]. As people with COPD commonly report frequent nocturnal awakenings [7], morning tiredness, and early awakenings [43], additional evaluation is needed to determine whether the item “problems waking too early” should be modified or deleted to assess insomnia severity in the COPD population. After model modification, model fit indices improved from poor to acceptable.

In addition, during CFA, the items “interference of sleep problems with daytime functioning” and “level of distress caused by sleep difficulties” showed the highest factor loadings (both 0.78). These findings indicate that impaired daytime functioning and distress due to sleep difficulties play a more important role in the insomnia experience of the COPD population than the other symptoms measured by the ISI. This is consistent with previous studies reporting that people with COPD and insomnia had higher prevalence of daytime sleepiness and reduced exercise capacity [12,44]. COPD-related daytime symptoms negatively affect patients’ ability to perform normal daily activities such as getting up/out of bed, personal hygiene (e.g., showering), dressing, physical activity (e.g., going up and down stairs), household chores, and shopping [45]. Additionally, fatigue induced by insomnia was found to have a strong negative effect on functional performance [46]. Furthermore, in previous qualitative research, people with COPD and insomnia reported that being awake much of the night due to shortness of breath caused thoughts of anxiety, fear, panic, and death [47]. As distress from poor sleep may be part of a cycle of dyspnea, insomnia, and poor self-care, future studies should give attention to developing self-management interventions focused on reducing the burden of multiple symptoms.

Our findings showed that the ISI has good criterion validity, which is supported by the weak to moderate correlation observed between scores for insomnia and for anxiety, depression, fatigue, and dyspnea. Previous research found that people with COPD and insomnia experienced multiple concurrent symptoms, including anxiety, depression, and fatigue, as well as disease-related symptoms such as dyspnea [48]. Anxiety and depression are known to be independent predictors of fatigue in people with COPD, which poses a major problem for functional performance [46]. Also, fatigue was found to be significantly correlated with other features of COPD such as reduced lung function, depression, and COPD exacerbation [49]. Therefore, our findings provide evidence that the ISI measures a construct that is associated with other, theoretically related constructs.

The mean ISI score in our study was 16.1 of 28, indicating moderate insomnia, and was similar to the 16.7 measured among cancer survivors with insomnia [27]. While previous estimates are inconsistent, 20%–70% of COPD patients are estimated to have insomnia [7,9,11]. Among people with COPD, insomnia can lead to detrimental outcomes such as COPD exacerbation, respiratory-related emergency service utilization, and high mortality [11]; however, insomnia remains under-recognized in this population. Therefore, our ISI findings will facilitate future identification of the presence and severity of insomnia in the COPD population.

The ISI has many strengths as a screening or diagnostic tool for insomnia. For example, it is easy to administer, less expensive than objective measures, and is able to assess self-reported insomnia symptoms (e.g., daytime fatigue, sleep dissatisfaction, and functional impairment) that are difficult to measure objectively. In particular, the ISI is a time-efficient tool with a low subject burden due to its relatively small number of items. Our findings provide psychometric evidence of the reliability and validity of the ISI among people with COPD. By integrating EFA and CFA, this study demonstrates the validity of using the ISI total score as an estimate of insomnia severity in the COPD population.

4.1. Limitations

This study has several limitations. First, generalizability questions could be raised due to the characteristics of the participants included in the study. For the randomized controlled trial that provided our data, participants were recruited using convenience sampling methods, and most were African American (76%). Moreover, due to the rigorous inclusion criteria for the parent study, our sample may not be adequately representative of the COPD population. Therefore, our findings should be interpreted with caution, and future studies should include samples that are more representative of the COPD population. Additionally, as this study employed a one-time measure of insomnia, the ISI's test-retest reliability and intra-rater reliability could not be examined. Also, we recognize that insomnia characteristics can change over time depending on the progress of COPD. Therefore, longitudinal data reflecting repeated measures of COPD progression are needed to confirm the results of our ISI validation. Lastly, the sample size of this study was small, although it met the rule of thumb for factor analysis requiring more than 10 times as many subjects ($n = 96$) as variables (seven items). The possibility of a small sample size effect on study findings should not be ignored.

5. Conclusions

We conclude that the ISI has acceptable reliability and validity for assessing self-reported insomnia severity among people with COPD. Additionally, we found that sleep problems’ interference with daytime functioning and distress caused by sleep difficulties were key insomnia experiences among people with COPD. Overall, the ISI can assist investigators in estimating the prevalence of insomnia in the COPD population as well as health professionals in screening for insomnia.

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Declaration of interest

None.

CRediT authorship contribution statement

Jeehye Jun: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Chang G. Park:** Conceptualization, Methodology, Formal analysis, Writing – review & editing. **Mary C. Kapella:** Conceptualization, Methodology, Investigation, Writing – review & editing, Supervision.

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