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ORIGINAL RESEARCH

Anxiety Inventory for Respiratory Disease: Cross-Cultural Adaptation and Semantic Validity of the Brazilian Version for Individuals with Chronic Obstructive Pulmonary Disease

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Background: Most instruments available to screen for anxiety in people with chronic obstructive pulmonary disease (COPD) are not disease specific. Therefore, the Anxiety Inventory for Respiratory Disease (AIR) was developed to measure anxiety for this patient group; however, it requires cross-cultural adaptation for use in non-English speaking countries.

Purpose: To carry out cross-cultural adaptation of the AIR scale for Brazilian patients with COPD and to analyze its semantic validity.

Patients and Methods: This methodological study followed six stages: 1) Initial translation by two independent translators fluent in English; 2) Synthesis of translations; 3) Back translation by two English first language translators; 4) Expert committee review (eight healthcare professionals, a methodologist, the translators, and back-translators); 5) Pre-final version evaluation with 30 patients with COPD through a cognitive interview; and 6) Submission of documents. Semantic validity was analyzed by agreement rate and content validity index (CVI) for the committee equivalence assessments.

Results: 1) Initial translation: the two translated versions presented eight divergences; 2) Synthesis of translations: the differences were discussed to reach consensus; 3) Back-translation: there were no important inconsistencies; 4) Expert Committee: the experts proposed eight and the instrument developer proposed three changes, which were analyzed and voted on, resulting in the pre-final version; 5) Evaluation of the pre-final version: data collection allowed for other changes and the formulation of instructions by applying the adapted instrument in an interview format. Patients rated the questions as clear or very clear; 6) The expert committee and the developer approved the final documents. The agreement rate and CVI were ≥ 0.80 for all items of the scale final version.

Conclusion: The process of cross-cultural adaptation followed all necessary stages and the semantic validity results were adequate, providing the Brazilian version of the AIR to assess anxiety symptoms in patients with COPD.

Keywords: COPD, AIR scale, surveys and questionnaires, Anxiety

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a major cause of morbidity and premature mortality in older people. COPD is associated with elevated risk of developing comorbidities and frequent cause of hospitalization.[1–3] Of these, anxiety is common and contributes to a considerable burden of morbidity in patients with COPD by impairing quality of life (QOL), reducing adherence to medical treatment, and early dropout from pulmonary rehabilitation.[2,4,5] In addition, the COVID-19 pandemic increased the susceptibility of patients with COPD to developing mental disorders such as anxiety and depression, reinforcing the importance of appropriately managing these conditions by healthcare professionals.[6]

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Anxiety is highly prevalent[7,8] in individuals with COPD. Untreated anxiety has major undesired consequences including increased disability and impaired QOL. However, there is a lack of compelling evidence on effective management of anxiety in patients with COPD.[9,10] This is partly due to anxiety mimicking COPD symptoms, and anxiety symptoms are often difficult to quantify, thereby contributing to underdiagnosis of anxiety.[9,11] Thus, accurately identifying comorbid anxiety in patients with COPD is the first step to improve clinical management and reinforce the importance of using a disease-specific anxiety assessment tool for these patients.[9,12]

Most instruments that are available for screening anxiety in individuals with COPD are not disease-specific.[1] Most studies utilized the Hospital and Anxiety Depression Scale (HADS) or Beck Depression Inventory (BDI) which have been validated for other chronic disease patient population.[13] Moreover, some of the items on these scales are based on somatic symptoms of anxiety which overlap with both the physical symptoms of COPD and the side-effects of medications for COPD (eg, heart palpitations and breathlessness),[13,14] reducing the diagnostic accuracy of anxiety disorder.[14]

Therefore, in 2013, the Anxiety Inventory for Respiratory Disease (AIR) was developed as a disease-specific anxiety measure for patients with COPD. The AIR is a non-somatic scale which incorporates the symptoms of patients and that has been designed using both emic and etic perspectives of patients with COPD. However, the instrument was developed for native English speakers with COPD[12] and subsequently adapted to the Chinese,[15] Arabic,[16] and Indian (Hindi)[14] languages. For the proper use of an instrument developed in another country, it must first undergo translation and cross-cultural adaptation in countries with a different language and cultural diversity.[17,18] In this context, the present study performed cross-cultural adaptation and analyzed the semantic validity of the AIR scale for Brazilian patients with COPD.

Materials and Methods

Type of Study and Ethical Aspects

This is a methodological study[19] of cross-cultural adaptation of the AIR scale.[20] The study was approved by the Human Research Ethics Committee of the Federal University of Santa Catarina (CAAE 90918518.7.0000.0121). All study participants signed the informed consent form. This study complies with the Declaration of Helsinki and was performed according to ethics committee approval.

Participants

Individuals with COPD of both sexes treated at the outpatient service of a state public hospital in the city of Florianopolis in Santa Catarina, Brazil, participated in the study. A non-probabilistic convenience sampling was performed. The sample size of 30 to 40 patients was based on the recommendations of previous study by Beaton et al.[18]

The following inclusion criteria were used in this study: diagnosis of COPD by a pulmonologist based on clinical history and spirometry results;[1] regular clinical follow-up; age ≥ 40 years;[15] clinical stability (without hospitalization or exacerbation in the previous four weeks); being a current smoker or ex-smoker;[21] not having an associated respiratory disease that predominated over COPD (eg restrictive respiratory disease); not having severe and uncontrolled cardiac disease; and speaking Portuguese. Patients who presented with cognitive impairment (Mini-Mental State Examination (MMSE) < 23)[22] or who could not understand or perform any of the data collection procedures were excluded.

Procedures

The AIR cross-cultural adaptation process was performed after obtaining permission from the instrument developer and followed the Beaton et al[18] recommendations, which have been widely used in cross-cultural adaptation studies.[15,20,23–25]

In Stage I, the original instrument was independently translated by two bilingual translators (T1 and T2) who had the target language (Portuguese) as their mother tongue. In Stage II, the two initial translations were synthesized through a discussion by online meeting. In Stage III, the T1 and T2 version was independently back translated by two different translators blinded to the original version and naive to the instrument outcome measurement.

In Stage IV, the Expert Committee (composed by 1 Methodologist;1 Pulmonologist; 1 Psychiatrist; 1 Psychologist; 1 Physical therapist; 1 Occupational Therapist; 2 Initial Translators; and 2 Back Translators)[18,23,26] initially evaluated the

T1 and T2 versions for clarity and equivalence (semantic, idiomatic, and conceptual/cultural) through open questions considering all versions of the instrument. They also scored the semantic equivalence of each item in the T1 and T2 version using a Likert scale (1 = Not equivalent; 2 = Difficult, to assess term equivalence without translation or back-translation review; 3 = Equivalent but needs further changes due to translation ambiguity; 4 = Moderately equivalent; 5 = Fully equivalent). The agreement rate among committee members was calculated and values ≥80% were considered acceptable.[26] Furthermore, content validity index (CVI) was used to measure the percentage of committee members who assigned values between 4 and 5 in the equivalence analysis.[20,26,27] Having a minimum CVI value of 0.78 is recommended for a committee with agreement of at least six members.[28] A second round of evaluation was performed by the Committee for the items that needed to be modified, based upon values below 3 using the Likert scale and/or agreement rate or CVI below the recommended levels.

Thereafter, the new instrument, the revised version and all the forms used for the evaluations were translated into English by one of the back-translators and sent to the instrument developer for perusal. Thus, the pre-final version of the instrument was obtained.

Stage V consisted of a cognitive interview[29] with COPD patients. At this stage, clinical, anthropometric, and socioeconomic[30] and demographic characteristics were extracted from the participants. Pulmonary function was also assessed by a spirometer.[31,32] Then, we assessed health status by the COPD assessment test (CAT)[33] and breathlessness using the Medical Research Council (MRC) scale.[34]

For each question of the AIR, the patients were asked: "Can you tell me in your own words what is being asked in this question?". They were also asked about terms considered more prone to double meaning or challenging to understand, and whether the response options were adequate for that question. Patients chose between the options to assess the degree of clarity of each question: "Not at all clear", "A little clear", "Clear" and "Very clear". The following question was added to the interview in cases where the researcher noticed signs of confusion, contradictions, ambiguity, or reluctance: "It took you a while to answer this question. What were you thinking? Did you experience any difficulties?"

Stage VI consisted of submitting all reports and forms of the adaptation stages to the expert committee and the instrument developer.

Results

Stage I – Initial Translation

The two translated versions showed differences in: the title, the guiding phrase of the instrument, four questions regarding semantics, and one question regarding the verb used in the sentence. In addition, there was a difference in one of the response options.

Stage II – Synthesis of the Translations

Some discrepancies arose that the translators resolved by consensus. Between the two title options, "Anxiety Inventory for Respiratory Diseases" and "Anxiety Inventory for Respiratory Disorders" it was considered that the term "diseases" would be the most appropriate. Other inconsistencies and the consensus reaching the agreement of version T12 is shown in Table S1.

Stage III – Back-translation

The back-translations of the synthesized translated version T12 did not show important inconsistencies but guided the experts' analysis. Inconsistencies are shown in Table S2.

Stage IV – Expert Committee Review

The committee's modifications included: In the questionnaire header, from "Name/Code" to "Name/Registration No." and from "think back over the last 2 weeks" to "think back over the 2 last weeks"; Q.1) "I have had worrying thoughts going through my mind" to "I have had thoughts of worry going through my mind"; Q.3) "I have felt exhausted and/or upset" to "I have felt irritated and/or upset"; Q.4) "I have had a fear of losing control and/or falling apart" to "I have had

a fear of losing control and/or going crazy"; Q.5) "I have worried about feeling panicky" to "I have worried whether I would feel panicky"; "Never" to "Not at all"; and "Occasionally" to "Sometimes".

After committee analysis, the Portuguese version was translated into English by one of the back-translators and forwarded to the AIR developer, who suggested three modifications: Q.3) "I have felt irritated and/or upset" to "I have felt irritated and/or agitated"; Q.4) "I have had a fear of losing control and/or going crazy" to "I have had a fear of losing control and/or being unable to deal with situations"; Q.5) "I have worried whether I would feel panicky" to "I have worried about feeling panicky".

Table 1 presents the agreement rate and CVI among the experts. Agreement rates ranged from 80 to 90%, except for two questions (Q-3 and Q-4).

The Question 3 showed the most inconsistencies and underwent three changes. The only initial question with a CVI value below 0.78, after the final changes, the second-round evaluation by the committee resulted in a CVI of 1 and a percentage of agreement of 83%. The question 4 was changed twice, and the percentage of agreement also increased to 83% in the second committee evaluation.

Despite having an agreement rate of 80% and a CVI of 0.8, question 5 received a score below four by two experts. Thus, it underwent two changes, and all experts scored the question with four or more in the second evaluation, resulting in a CVI of 1.

Stage V – Pre-final Version Testing

A total of 38 patients were initially evaluated. Eight patients were excluded because they did not meet the minimum MMSE score > 23 criteria for this study. Thus, 30 patients with COPD participated in this study, and sociodemographic characteristics are presented in Table 2.

The cognitive interview showed that individuals had difficulty understanding certain concepts. Thus, a manual was prepared with standard guidelines. In addition, there was a need to apply the questionnaire in an interview format.

Table 1 Expert Ratings (n = 10), % of Agreement and CVI Score for Semantic Equivalence Assessment

Expert rates[a]											**Percentage (%) of agreement**[b]	**CVI**[c]
Question	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**		
Q-1	5	5	4	5	5	4	5	5	5	5	80	1
Q-2	5	5	4	4	5	5	5	5	5	5	80	1
Q-3	5	5	4	3	2	2	5	5	2	5	50[d]	0.6[e]
Q-4	5	5	5	4	3	5	5	5	4	5	60[d]	0.9
Q-5	5	5	3	5	5	2	5	5	5	5	80[d]	0.8[e]
Q-6	5	5	5	4	5	5	5	5	5	5	90	1
Q-7	5	5	4	5	5	5	5	5	5	5	90	1
Q-8	5	5	3	5	5	4	5	5	5	5	80	0.9
Q-9	5	5	4	5	5	5	5	5	5	5	90	1
Q-10	5	5	4	5	5	5	5	5	5	5	90	1

Notes: CVI, content validity index; [a] 10 experts (A to J) evaluated the T12 version (2 = difficult to assess term equivalence without translation or back-translation review; 3 = equivalent, but needs further changes due to translation ambiguity; 4 = moderately equivalent; 5 = fully equivalent). [b] Values equal to or greater than 80% were considered acceptable [c] Values above 0.78 were considered acceptable [d] Values rose to 83% in the second round of evaluation by the committee. [e] Values rose to 1 in the second round of evaluation by the committee.
Abbreviation: CVI = content validity index.

Table 2 Sociodemographic, Anthropometric and Clinical Characteristics of Patients with COPD (N = 30)

Characteristics	Results
Age (years)	61.73 (7.54)
Sex (n)	
Female / Male	16/ 14
Level of education (n)	
Illiterate/Complete or Incomplete Elementary School	25
Middle School / High School /College	5
Socioeconomic level (n)	
Medium	21
Low	9
Body mass index (kg/m^2)	26.27 (7.35)
Smoking status (n)	
Smoker	10
Former smoker	20
Pack-years	45.86 (35.00)
Pulmonary function	
FEV_1 (L)	1.28 (0.54)
FEV_1 (% of predicted)	47.97 (16.65)
FVC (L)	2.42 (0.76)
FVC (% of predicted)	72.17 (14.79)
FEV_1/FVC (L)	0.52 (0.11)
GOLD 1 (n)	2
GOLD 2 (n)	11
GOLD 3 (n)	14
GOLD 4 (n)	3
Dyspnea (MRC)	2.73 (1.11)
CAT score	17.6 (10)

Notes: Results presented as mean (standard deviation) or absolute values.
Abbreviations: FEV_1, forced expiratory volume in the first second; FVC, forced vital capacity; MRC, Medical Research Council; GOLD, Global Obstructive Lung Disease; CAT, COPD Assessment Test.

Therefore, two changes were suggested in the header of the scale. The AIR developer agreed with the new application format and suggested including information on how to record the responses in the questionnaire.

In addition, it was observed that the questions 2 "I have felt very frightened or panicked" and 7 "I have had sudden and intense feelings of fear and/or panic" had similar meanings. Thus, we asked the author if there were any guidelines on asking patients to emphasize the difference between these two questions or if they were designed to have similar

meanings. The author replied: "The first question is more about the "fear" the person experiences. On the other hand, the second question refers to "the magnitude of the experience" or "the extent to which something will happen". This information has also been added to the instruction manual.

Another point observed was that many patients with COPD did not know the meaning of "panic", "anxious", and "on the edge". Therefore, it was suggested to the AIR developer to add the meaning of these words to the application manual, who agreed and incorporated the definitions.

Other changes that occurred at this stage due to the low level of understanding of the patients were in question 3: "I have felt irritated and/or agitated" to "I have felt irritated and/or bothered", and in question 7: "I have had sudden and intense feelings of fear and/or panic" to "I have had unexpected and strong feelings of fear and/or panic".

After altering the pre-final version and elaborating the instructions for its application, with the author's considerations, the new format was sent back for further scrutiny. It was suggested to the author that the questions on the scale be numbered and that guidance on scoring the questionnaire score be added to the manual. His response regarding the new version and the application manual was positive, suggesting only a few minor corrections regarding the writing style of the manual. In addition, the committee agreed to all changes.

The results related to the degree of clarity of the questions according to the patients are shown in Table 3. Most of the questions were classified as "Clear" (score 3) or "Very clear" (score 4). The "Unclear" score was only observed in four questions for few patients. These results were also considered for the changes made in this stage.

The main changes made from version T12 to the final version of the instrument, including changes made by the committee, author, and patients, are shown in Table S3.

Table 3 Degree of Clarity of Each Question of the Pre-Final Version According to the Patients[a] (N = 30)

AIR questions										
ID	**Q-1**	**Q-2**	**Q-3**	**Q-4**	**Q-5**	**Q-6**	**Q-7**	**Q-8**	**Q-9**	**Q-10**
1	3	3	3	3	3	3	3	3	3	3
2	3	3	3	3	3	3	3	3	3	3
3	4	4	4	4	4	4	4	3	4	4
4	3	3	3	4	4	3	4	4	3	3
5	4	3	4	4	3	3	3	3	3	3
6	3	**2**	3	3	**2**	3	3	**2**	3	3
7	3	3	3	3	3	3	3	3	3	3
8	3	3	3	3	3	3	3	3	3	3
9	3	3	3	3	3	3	3	3	3	3
10	3	3	3	3	3	3	3	3	3	3
11	4	3	3	3	3	3	3	3	3	3
12	4	4	4	3	3	3	3	4	3	3
13	3	3	3	3	3	3	3	3	3	3
14	3	3	3	4	3	3	3	3	3	3

(*Continued*)

Table 3 (Continued).

AIR questions										
15	3	3	3	3	3	3	3	3	3	3
16	3	3	3	3	3	3	3	3	3	3
17	3	3	3	3	3	3	**2**	3	3	3
18	4	4	3	3	3	3	3	3	3	3
19	3	3	3	3	3	3	4	3	3	4
20	4	3	4	4	4	4	3	4	4	4
21	4	4	4	4	4	4	4	4	4	4
22	4	3	3	3	3	4	3	4	4	4
23	4	4	4	4	4	4	4	4	4	4
24	3	3	3	3	3	3	3	3	3	3
25	3	4	4	3	3	4	3	4	4	4
26	3	3	3	3	3	3	3	3	3	3
27	4	4	4	3	3	3	3	3	3	3
28	3	3	3	3	3	3	3	3	3	3
29	3	3	3	3	3	3	**2**	3	3	4
30	3	3	3	3	3	3	3	3	3	3

Notes: Q-1 a Q-10 = Question 1 to 10 of the pre-final version; [a] The Table 3 shows the values for the questions for the level of clarity: 1- Not clear 2 - A little clear, 3 - Clear and 4 - Very clear.
Abbreviations: AIR, Anxiety inventory for respiratory disease; ID, Patient identification.

Stage VI – Submission of Documentation

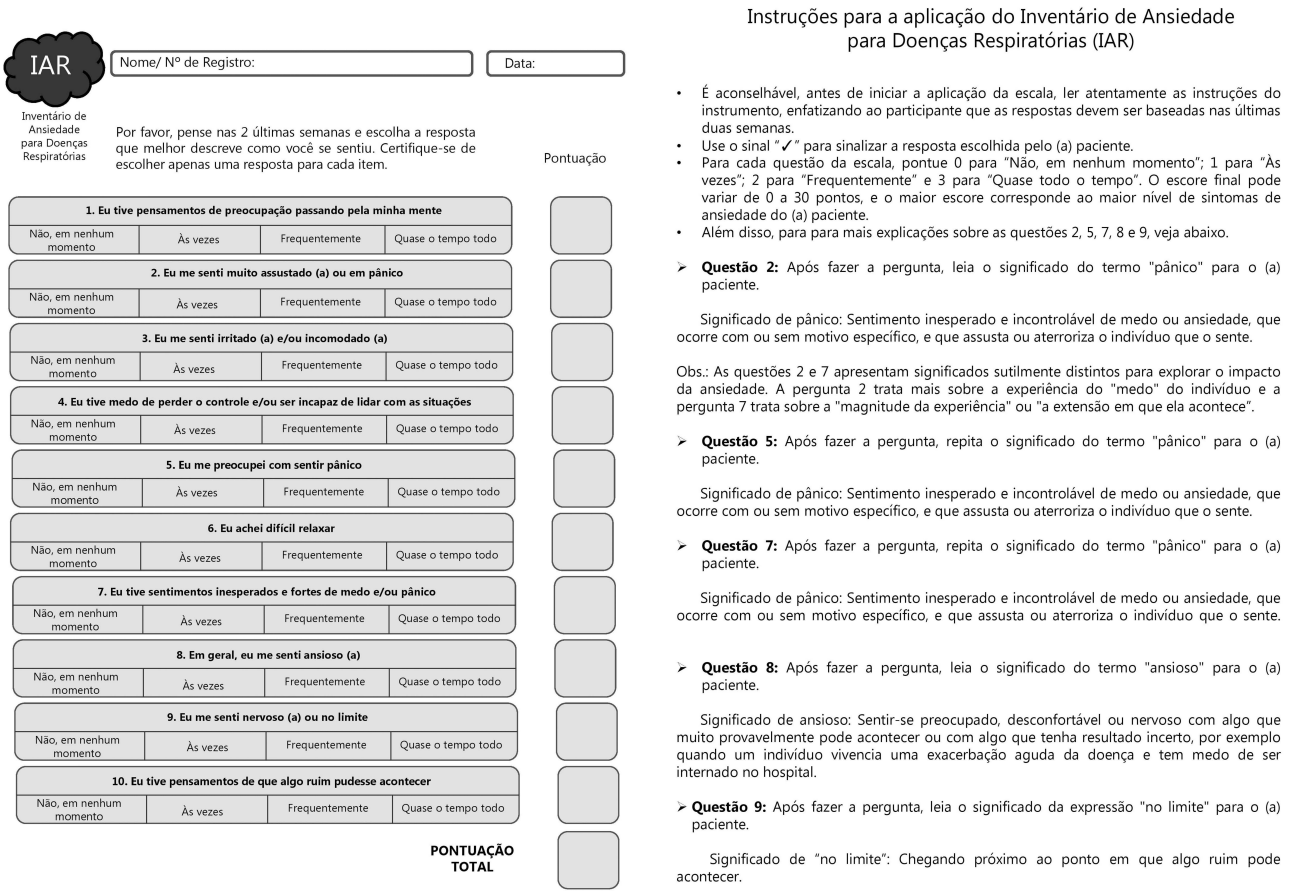
At this stage, the expert committee and the design of the scale author analyzed that all steps were completed correctly and opted for the full approval of the adaptation process. The Brazilian Portuguese version and manual of the AIR questionnaire are presented in Figure 1. The translated version of the figure is presented in Figure S1.

Discussion

The present study carried out cross-cultural adaptation and analyze the semantic validity of the AIR scale for Brazilian patients with COPD. All cross-cultural adaptation stages were strictly followed, and the semantic validity results were adequate.

The cross-cultural adaptation of an instrument must be made using a standardized method to achieve equivalence between the original and the target version of the questionnaire. In addition, it must be translated with linguistic accuracy and culturally adapted to maintain the content validity for the measures to be used in other cultures. This allows greater confidence in the instrument and how the impact of a disease or its treatment will be described and measured.[17,18,35] We adopted the guideline of Beaton et al[18] for the cross-cultural adaptation process. This guideline has been widely used in cross-cultural adaptation studies[20,23,24] and follows the recommendations of the COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN).[36]

According to Epstein et al,[23] different methods are available for the process of cross-cultural adaptation of measuring instruments, with a lack of evidence for the best method to utilize. Therefore, most methods would likely achieve


IAR

Nome/ Nº de Registro:

Data:

Inventário de Ansiedade para Doenças Respiratórias

Por favor, pense nas 2 últimas semanas e escolha a resposta que melhor descreve como você se sentiu. Certifique-se de escolher apenas uma resposta para cada item.

Pontuação

	Não, em nenhum momento	Às vezes	Frequentemente	Quase o tempo todo
1. Eu tive pensamentos de preocupação passando pela minha mente				
2. Eu me senti muito assustado (a) ou em pânico				
3. Eu me senti irritado (a) e/ou incomodado (a)				
4. Eu tive medo de perder o controle e/ou ser incapaz de lidar com as situações				
5. Eu me preocupei com sentir pânico				
6. Eu achei difícil relaxar				
7. Eu tive sentimentos inesperados e fortes de medo e/ou pânico				
8. Em geral, eu me senti ansioso (a)				
9. Eu me senti nervoso (a) ou no limite				
10. Eu tive pensamentos de que algo ruim pudesse acontecer				

PONTUAÇÃO TOTAL

Instruções para a aplicação do Inventário de Ansiedade para Doenças Respiratórias (IAR)

- É aconselhável, antes de iniciar a aplicação da escala, ler atentamente as instruções do instrumento, enfatizando ao participante que as respostas devem ser baseadas nas últimas duas semanas.
- Use o sinal "✓" para sinalizar a resposta escolhida pelo (a) paciente.
- Para cada questão da escala, pontue 0 para "Não, em nenhum momento"; 1 para "Às vezes"; 2 para "Frequentemente" e 3 para "Quase todo o tempo". O escore final pode variar de 0 a 30 pontos, e o maior escore corresponde ao maior nível de sintomas de ansiedade do (a) paciente.
- Além disso, para para mais explicações sobre as questões 2, 5, 7, 8 e 9, veja abaixo.

➢ **Questão 2:** Após fazer a pergunta, leia o significado do termo "pânico" para o (a) paciente.

Significado de pânico: Sentimento inesperado e incontrolável de medo ou ansiedade, que ocorre com ou sem motivo específico, e que assusta ou aterroriza o indivíduo que o sente.

Obs.: As questões 2 e 7 apresentam significados sutilmente distintos para explorar o impacto da ansiedade. A pergunta 2 trata mais sobre a experiência do "medo" do indivíduo e a pergunta 7 trata sobre a "magnitude da experiência" ou "a extensão em que ela acontece".

➢ **Questão 5:** Após fazer a pergunta, repita o significado do termo "pânico" para o (a) paciente.

Significado de pânico: Sentimento inesperado e incontrolável de medo ou ansiedade, que ocorre com ou sem motivo específico, e que assusta ou aterroriza o indivíduo que o sente.

➢ **Questão 7:** Após fazer a pergunta, repita o significado do termo "pânico" para o (a) paciente.

Significado de pânico: Sentimento inesperado e incontrolável de medo ou ansiedade, que ocorre com ou sem motivo específico, e que assusta ou aterroriza o indivíduo que o sente.

➢ **Questão 8:** Após fazer a pergunta, leia o significado do termo "ansioso" para o (a) paciente.

Significado de ansioso: Sentir-se preocupado, desconfortável ou nervoso com algo que muito provavelmente pode acontecer ou com algo que tenha resultado incerto, por exemplo quando um indivíduo vivencia uma exacerbação aguda da doença e tem medo de ser internado no hospital.

➢ **Questão 9:** Após fazer a pergunta, leia o significado da expressão "no limite" para o (a) paciente.

Significado de "no limite": Chegando próximo ao ponto em que algo ruim pode acontecer.

Figure 1 Brazilian Portuguese version of the Anxiety Inventory for Respiratory Disease.

comparable results, and choosing one is a matter of preference and logistics. In this study, the essential phases of the cross-cultural adaptation process were carefully examined and met the Beaton et al[18] guideline recommendations.

Another point to highlight is the lack of consensus regarding the composition of the expert committee.[23,37] In general, guidelines mention the need to include methodologists, health professionals who are familiar with the content areas of the construction of the instrument, and the translators (forward and back translators).[18,23] Furthermore, the original developer of a questionnaire should be closely involved in the adaptation of the scale by giving feedback to the expert committee.[18] All these recommendations were met in our study. None of the guidelines identified by Epstein et al[23] recommend a specific number of committee members. Alexandre and Coluci[26] identified studies that recommend a minimum of five and a maximum of ten members and others that suggest six to twenty subjects. Our expert committee comprised 10 individuals, which met these recommendations. Furthermore, as with the participation of five or less subjects, everyone must agree or present an CVI equal to 1 to be considered representative, we chose to include at least six members.

Guidelines vary widely in recommending the number of patients for pre-final version testing stage. Some guidelines do not present any recommendation, and others recommend a minimum of five and a maximum of 50 people.[23] Our study of 30 patients adhered to the recommendations of Beaton et al[18] which was also used in other studies.[20,25]

Committee members attested to the clarity as well as semantic, idiomatic, and conceptual/cultural equivalences of the instrument. Furthermore, there was no suggestion to exclude or include new items in the scale. These findings are similar to versions of the AIR that have been cross-culturally adapted to other languages.[15,16,24]

Satisfactory results were observed for semantic equivalence of the questionnaire, based upon a CVI of at least 0.78 and an agreement rate of 80%.[28] Only one of the questions had a lower CVI value (0.6) in the first committee assessment. However, the CVI became 1 after reviewing this revised question at the second assessment by the committee members.

Regarding the percentage of agreement between the committee in the first evaluation, two questions showed a lower (smaller) percentage of agreement (50 and 60%), and four questions showed moderate values (80%) of agreement, all of which were revised for the final version of the scale. CVI values for the rest of the items ranged from 0.8 to 1.0, and the agreement rate was 90%.

A cognitive interview was performed with patients with COPD to evaluate the AIR pre-final version. Despite being considered one of the most prominent methods for identifying and correcting problems with research questions,[38] the cognitive interview does not have a consensus agreement on its utilization in cross-cultural adaptations. However, one of the most common cognitive interview practices involves applying a list of research questions to assess response quality or to help determine whether a question is generating information that the original author(s) intended to be measured.[29,38]

The cognitive interview format is not standardized in the available literature. Therefore, the questions are formulated by the research authors. Among the questions used in this study, the one that said, "in your words, what was this question asking you?" managed to demonstrate the questions with the most doubts or with incomplete considerations by the participants. For example, in the case of question 3 ("I have felt irritated or agitated"), only four patients considered both terms and sixteen commented only on the term "irritated". Furthermore, when patients were asked about the meaning of some words, few participants knew how to define them correctly, such as the word "panic", in which only a third of the patients with COPD knew what they really meant. They provided the explanations related to difficulty in answering the questions including: "It is difficult to answer, because we have little education" and "I get nervous to answer things correctly".

These findings could be explained by the educational level of the patients evaluated in this study, and the reality of the Brazilian population in which COPD predominantly affects patients with low socioeconomic status and low literacy level. According to the Brazilian Institute of Geography and Statistics, only 32.5% of the adult population had completed high school in 2019. Moreover, about 18% of aged 60 years or older are illiterate.[39] In addition to the educational level, socioeconomic status directly influences the social inequality of the population, providing access restrictions in multiple dimensions.[40] In this study, 30% of the participants are from the lowest two socio-economic status classes.

The difficulties encountered by the patients during the cognitive interview motivated the modification of the questionnaire administration mode to an interview format, as well as the creation of an application manual, with the discussion and approval of the instrument developer. Studies that have compared self-administered and interview-based questionnaires have shown that these methods produce similar results and have adequate measurement properties.[41,42] Therefore, we believe that the fact that the original instrument is self-administered does not affect the comparability of the studies and does not necessarily require an adaptation of the original instrument, which was developed for a population with different socioeconomic characteristics. However, future studies are needed comparing the modes of administration may elucidate the value of the AIR scale.

There are several limitations in this study. First, the study focused on Brazilian patients, convenience sample and with sociodemographic characteristics of the patients with COPD who participated in the study, may affect its external validity and generalizability. Second, our patient population predominantly included individuals with moderate-to-severe COPD, low level of education, and low socioeconomic status. Third, it was not possible to use weighted kappa statistics to assess agreement between members of the expert committee, as most of the evaluators' scores were constant throughout the development of the scale. Therefore, we used the agreement rate, CVI and individual Likert Scale scores for the decision-making process, which is supported by Alexandre and Coluci[26] and Almanasreh et al.[27] Finally, the adapted version of the AIR scale for Brazil should be examined for its psychometric measurement properties, including construct validity by factor analysis, convergent validity, test-retest reliability, internal consistency and measurement error and responsiveness to rehabilitation.[43]

Conclusion

In conclusion, we have potentially reduced the scarcity of validated and specific tools to assess anxiety symptoms for patients with COPD population. Our study offers a valid instrument that is cross-culturally adapted to Brazilian Portuguese, with a high quality and methodological rigor, to screen for anxiety symptoms in both clinical practice and research. Further, prospective research study is required with larger sample size to assess the measurement properties of the Brazilian version of the AIR.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest related to this work.

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