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RESEARCH ARTICLE (ORIGINAL)

Adaptation and validation of the Coping Behavior Inventory into European Portuguese

Adaptação e validação do instrumento Coping Behavior Inventory para o idioma português europeu

Adaptación y validación del Coping Behavior Inventory al portugués europeo

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Abstract

Background: Nursing students are exposed to stress during their nursing program, particularly during clinical practice. Identifying the coping strategies used during this period can help identify resources to mitigate the stress they face.

Objective: To translate and validate the Coping Behavior Inventory (CBI) into European Portuguese.

Methodology: Methodological study with a nonprobability sample of 113 students attending the four years of the nursing program. To assess the psychometric properties of the instrument, its validity was analyzed using the principal component analysis method and its internal consistency by calculating Cronbach's alpha coefficient.

Results: Four common factors were extracted from the exploratory factor analysis, explaining 57.5% of the variance, with a Cronbach's alpha value of 0.668 for the total scale.

Conclusion: The European Portuguese version of the CBI has adequate psychometric characteristics and is a reliable tool for assessing the coping strategies used by nursing students.

Keywords: nursing; students; surveys and questionnaires; coping

Resumo

Enquadramento: Os estudantes de enfermagem estão sujeitos a *stress* ao longo do curso de enfermagem sobretudo durante a prática clínica. O conhecimento das estratégias de *coping* utilizadas permite identificar recursos para mitigar o stress a que estes estão sujeitos.

Objetivo: Traduzir e validar o instrumento *Coping Behaviour Inventory* para o idioma português europeu.

Metodologia: Trata-se de um estudo metodológico onde foi utilizada uma amostra não probabilística de 113 estudantes dos 4 anos do curso de licenciatura em enfermagem. Para a aferição das propriedades psicométricas do instrumento foi determinada a validade de construto da escala pelo método de análise de componentes principais e a consistência interna pelo cálculo do coeficiente alfa de Cronbach.

Resultados: Pela análise fatorial exploratória foram extraídos quatro fatores comuns que explicam 57,5% da variância retida sendo o valor alfa de Cronbach para a escala total de 0,668.

Conclusão: O Inventário de comportamentos de *coping* apresenta características psicométricas adequadas no idioma português europeu, sendo um instrumento fiável na avaliação das estratégias de *coping* utilizadas pelos estudantes de enfermagem.

Palavras-chave: enfermagem; estudantes; inquéritos e questionários; coping

Resumen

Marco contextual: Los estudiantes de enfermería están sometidos a estrés a lo largo de sus estudios, especialmente durante las prácticas clínicas. El conocimiento de las estrategias de afrontamiento (*coping*) utilizadas nos permite identificar recursos para mitigar el estrés al que están sometidos.

Objetivo: Traducir y validar el instrumento *Coping Behavior Inventory* para el idioma portugués europeo.

Metodología: Se trata de un estudio metodológico que utilizó una muestra no probabilística de 113 estudiantes de los cuatro años de la carrera de Enfermería. Para evaluar las propiedades psicométricas del instrumento, se determinó la validez de constructo de la escala mediante el método de análisis de componentes principales y la consistencia interna mediante el cálculo del coeficiente alfa de Cronbach.

Resultados: El análisis factorial exploratorio extrajo cuatro factores comunes que explican el 57,5% de la varianza retenida, con un valor alfa de Cronbach para la escala total de 0,668.

Conclusión: El Inventario de Comportamientos de Afrontamiento tiene características psicométricas adecuadas en portugués europeo y es un instrumento fiable para evaluar las estrategias de afrontamiento utilizadas por los estudiantes de enfermería.

Palabras clave: enfermería; estudiantes; encuestas y cuestionarios; afrontamiento

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Introduction

Nursing students experience high levels of stress during their undergraduate nursing education, which increase during clinical practice (Bhurtun et al., 2021). The sources of this stress are multifactorial and can have a negative impact on academic performance by reducing their ability to interact safely (Kalikotay et al., 2023). Effective coping strategies are recognized as important resources that enable students to face threats and reduce stress and its negative effects (Sheu et al., 2002). Coping strategies have been extensively studied in recent years, and several instruments have been developed to assess them in nursing students, including the Coping Behavior Inventory (CBI; Sheu et al., 2002). This instrument has been used in several languages and sociocultural contexts, but it has not yet been validated for European Portuguese.

Therefore, this study aimed to translate and validate the CBI into European Portuguese for assessing coping strategies in nursing students.

Background

Coping is the process commonly used to help individuals maintain psychosocial adaptation under stressful conditions. It is defined as the use of cognitive and behavioral resources to deal with internal and external stressors (Lazarus & Folk, 1984). As a complex phenomenon, it contributes to changes in mental health disorders and chronic health conditions, decreasing productivity, reducing quality of life, and exponentially increasing the cost of medication and recourse to health services (Manosso et al., 2022). According to Lazarus and Folk (1984), stress occurs when there is an imbalance between environmental demands and the individual's resources to meet them. Individuals use different resources to cope with stress. Coping is one of the processes that mediates the relationship between the person and the environment, managing the problem that causes suffering and controlling the individual's emotional reaction. The same authors state that coping strategies can be learned and that individuals with a wider range of strategies have lower stress levels (Lazarus & Folk, 1984). Nursing students encounter various challenging situations during their academic career, particularly in clinical practice, which can make them vulnerable to stress. Prolonged exposure to stress and ineffective coping strategies can negatively impact the student's health, social well-being, academic performance, and quality of care (Sheu et al., 2002).

Identifying coping strategies in nursing students is essential to understanding whether they are prepared to deal with professional stress and how to mitigate its effects (Alanazi et al., 2023).

One common method for identifying coping strategies is through the use of measuring instruments. There are already several internationally validated instruments available for the nursing student population (Alkhawaldeh et al., 2023; Bhurtun et al., 2021; Kalikotay et al., 2023). The CBI stands out as one of the most widely used instruments due to its simplicity of application, validity, and adequate psychometric properties (Fitzgibbon & Murphy, 2022). It was originally created by Sheu et al. (2002) and comprises 19 items grouped into four factors rated on a 5-point Likert scale (0 to 4). A higher score on a factor indicates more frequent use of this coping strategy. The first factor is called Avoidance behaviors and includes 6 items for developing strategies to avoid the stressful situation. The second factor is called Problem-solving behaviors and also includes six items. The third factor is called Optimistic coping behaviors and includes four items aimed at keeping a positive attitude towards the results of the stressful situation. Finally, the fourth factor is called Transference behaviors and includes three items related to transferring attention from the stressful situation to other situations. Originally, 33 coping behaviors were identified from the literature review and interviews with 100 nursing students. The evaluation of the psychometric properties of the CBI included the analysis of internal consistency (alpha's coefficient values of 0.76 for the total scale), test-retest, and exploratory factor analysis. After the item-total correlation analysis, the scale was reduced to 19 items. The factor analysis identified four factors that explained 38.2% of the variance, with Cronbach's alpha values for each category (0.57, 0.57, 0.59, and 0.55, respectively; Sheu et al., 2002). This instrument has been used internationally (Alanazi et al., 2023; Bhurtun et al., 2021; Gutiérrez-Puertas et al., 2022). Its translation and validation into European Portuguese will allow comparability and provide a tool for analyzing the coping strategies used by nursing students in Portugal.

The adaptation and validation of instruments enables researchers to effectively conduct cross-cultural and cross-sectional studies (Grove & Gray, 2022). When standardized and validated instruments are used to collect data from different populations, it becomes possible to make meaningful comparisons and identify patterns or differences between groups (Cha et al., 2007). This aspect allows for a deeper understanding of how different factors can influence results in different cultural or geographical contexts. In this way, the process of adapting and validating instruments is an essential tool to consider in research studies (Grove & Gray, 2022). By leveraging existing resources and ensuring data integrity, researchers can effectively collect meaningful data that not only represent the unique characteristics of diverse populations, but also allow for cross-comparisons for a more comprehensive understanding of various phenomena (Cha et al., 2007).

Research question

Is the European Portuguese version of the CBI a valid and reliable tool for identifying coping strategies in nursing students?

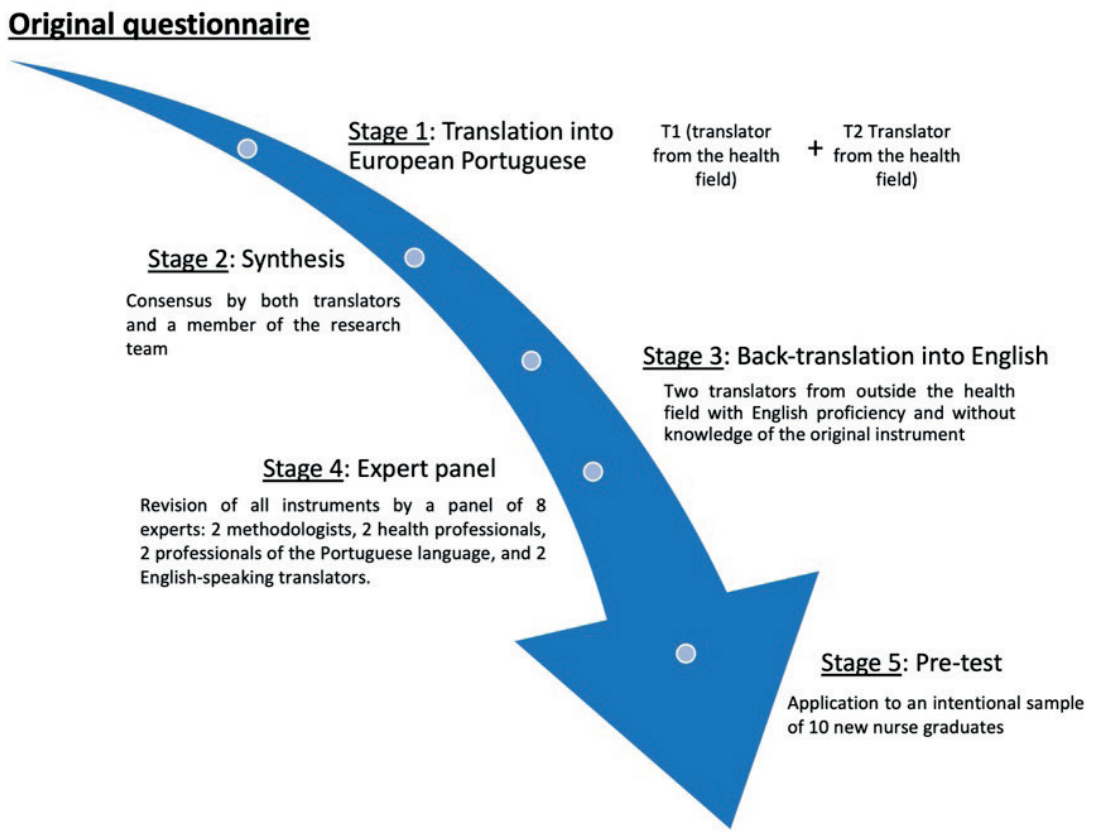
Methodology

This study describes the methodological process of translating and validating the CBI into European Portuguese.

It is part of a larger ongoing research project on coping strategies and social support among nursing students.
After formally contacting the authors of the original instrument (Sheu et al., 2002), the CBI was culturally adapted according to the recommendations for the translation and adaptation of health measurement instruments (Beaton et al., 1998). The first stage aimed to achieve linguistic and cultural equivalence of the instrument in European Portuguese. This process resulted in a pre-test version that was applied to a sample of 10 new nurse graduates (Figure 1).
In the second phase, the instrument was applied to a sample of 113 students from the four years of the undergraduate degree in nursing at a higher education health school. This stage aimed to assess the psychometric properties of the instrument in European Portuguese.
The first stage aimed to ensure the linguistic and conceptual equivalence of the instrument. In the first phase, two independent translators, both proficient in English and European Portuguese, were responsible for translating the instrument. The first translator, who worked in the health sector and had knowledge of the concepts used in the instrument, produced Translation 1 (T1). The second translator, who did not work in the health sector and had no knowledge of the concepts used, produced Translation 2 (T2).
In the second stage, the translations produced in stage 1 were agreed upon by both translators and a member of the research team in a single document (T12).
In the third stage, the instrument was back-translated. Using the T12 version, two translators, both from outside the health sector, with a command of English and no knowledge of the original instrument, back-translated it, producing two separate documents (RT1 and RT2).
In the fourth stage, a panel of experts was established, consisting of two methodologists with experience in translating and culturally adapting measuring instruments, two health professionals, two Portuguese-speaking professionals, and two native English-speaking translators. The versions and the original instrument were compared to ensure semantic and conceptual equivalence, and the pre-test version was created. To determine content validity, the content validity index (CVI) was calculated as an indicator of the extent of expert consensus. A desirable value of 0.90 was used (Grove & Gray, 2022). An average CVI value of 0.94 was obtained for the 19 items of the instrument. Twelve items showed absolute agreement (CVI = 1), five items showed a CVI of 0.88, and two items (item 9 and item 17) showed a CVI of 0.75. For items with lower CVI values, the translations were discussed until a consensus translation was reached.
In the last stage, the recommendations suggest administering the pre-test version of the instrument to a small group of the target population or a similar group (Beaton et al., 1998). In this case, the pre-test version of the instrument was applied to 10 new nurse graduates with similar characteristics to the target population.

Figure 1

Flowchart of the procedure for cultural adaptation of the CBI



To determine the psychometric properties, it is necessary to define the sample size in advance, with between two and 20 valid responses for each variable (Anthoine et al., 2014). A number of five responses was defined for each item, resulting in a sought sample size of >95 as the instrument consists of 19 items. The instrument was applied in June 2023 for a period of two weeks. The selected period corresponds to the end of the students' internships at the school where the study was conducted. It was chosen because it provided a sufficient sample size. The instrument was applied online and sent via email to undergraduate students (N = 263) who met the inclusion criteria detailed below.

Statistical analysis was performed using IBM SPSS Statistics software, version 27.0. The construct validity of the European Portuguese version of the CBI was measured using the principal component analysis method with Varimax rotation. To ensure the suitability of the factor model to the correlation matrix and subsequent factor analysis, the Bartlett's Test of Sphericity (BTS < 0.05), the Kaiser method, and the Kaiser-Meyer-Olkin tests (with a minimum acceptable KMO value > 0.6; Kaiser & Rice, 1974) were applied. The criteria of eigenvalue values greater than 1 and the Scree Plot graphical analysis were applied for retaining the components. Throughout this process, the number of items in the original instrument was maintained.

Cronbach's alpha coefficient was calculated to assess internal consistency. This measure helps to reduce the size of the data by calculating the degree of homogeneity or consistency between the initial variables, identifying a smaller set of hypothetical variables or factors that can be interpreted as latent dimensions (Grove & Gray, 2022). The criteria for application of the original version were maintained: nursing students who had carried out clinical practice and agreed to participate in the study. Students who had experience a serious incident (bereavement and/or serious illness) prior to their clinical practice were excluded.

This study was approved by the Technical-Scientific Council of Egas Moniz on July 5, 2022 (Opinion no. 117/21.22) and the Ethics Committee of Egas Moniz on July 28, 2022 (Opinion no. 1114.22). The online questionnaire provided an explanation of the study, the intended type of participation, and requested informed consent. It specified that participation was voluntary and that students could withdraw at any time without penalty. Additionally, it ensured anonymity, confidentiality, and data protection. To complete the form, students had to give their consent to participate in the study.

Results

In the first phase, 10 questionnaires were sent by email to new nurse graduates. The questionnaire included a field for suggestions and/or questions after each question. Furthermore, the researchers contacted each new graduate by telephone to confirm their understanding of the questions and clarity of the items. Thus, no changes were made after the pre-test. The European Portuguese version of the CBI was entitled *Inventário de Comportamentos de Coping*.

In the second phase, emails were sent to 263 students from the four academic years. Two students were excluded and not included on the email list. The return rate was 43% (n = 113). The participants were mostly women (91.2%; n = 103), aged between 18 and 51 years (M = 22.84; SD = 5.3), and evenly distributed across the four academic years, as can be seen in Table 1.

Table 1

General characteristics of the sample

Variables	*n*	%
Gender		
Female	103	91.2%
Male	10	8.8
Academic Year		
1st year	23	20.4%
2nd year	26	23%
3rd year	37	32.7%
4th year	27	23.9%
Age		
18 – 20	34	30.1%
21 – 22	43	38.1%
> = 23	36	31.9%

Note. n = Number of participants; % = Percentage.

With regard to the analysis of psychometric properties, the relational structure of the answers to the 19 questions in the European version of the CBI was evaluated through an Exploratory Factor Analysis (EFA) on the correlation matrix. Factors were extracted using the principal components method followed by Varimax rotation. The desired number of factors was not determined a priori. The four factors were extracted from the components with eigenvalues greater than 1, in line with the Scree Plot analysis.

The percentage of variance retained was 57.5%. The validity of the EFA was assessed using Bartlett's test of sphericity (x^2 (171) = 865.865; $p < 0.001$) and the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO = 0.734).

Table 2 shows the factor loadings of each item on each of the four factors, their eigenvalues, the communality of each item, and the percentage of variance explained by each factor.

Table 2

Matrix of item loadings in the principal components factor analysis with Varimax orthogonal rotation (four-factor solution)

	Rotation matrix	Components				h2
Dimensions	**Items**	**1**	**2**	**3**	**4**	
Problem-solving behaviors	To set up objectives to solve problems	0.772				0.627
	To find the meaning of stressful incidents	0.728				0.569
	To make plans, list priorities, and solve stressful events	0.714				0.553
	To employ past experience to solve problems	0.701				0.613
	To adopt different strategies to solve problems	0.510				0.407
	To have confidence in performing as well as senior schoolmates	0.496				0.510
Optimistic coping behaviors	To save time for sleep and maintain good health to face stress		0.718			0.571
	To relax via TV, movies, a shower, or physical exercises		0.696			0.522
	To have confidence in overcoming difficulties		0.693			0.674
	To keep an optimistic and positive attitude in dealing with everything in life		0.665			0.710
	To see things objectively		0.590			0.602
	To cry, to feel moody, sad, and helpless		-0.438			0.504
Avoidance behaviors	To avoid teachers			0.780		0.668
	To avoid difficulties during clinical practice			0.726		0.535
	To expect others to solve the problem			0.616		0.623
	To quarrel with others and lose temper			0.573		0.465
Transference behaviors	To have a big meal and take a long sleep				0.739	0.589
	To expect miracles so one does not have to face difficulties				0.656	0.608
	To attribute to fate				0.564	0.575
Total variance: 57.5%						
Variance explained by component		27.10%	14.30%	9.30%	6.80%	
Eigenvalue		5.148	2.722	1.762	1.291	

Note. h^2 = Communalities.

Table 2 shows the maintenance of both the total number of items and the four dimensions, which account for 57.5% of the explained variance. The item loadings in the 1st dimension ranged from 0.772 to 0.496, in the 2nd dimension from 0.718 to -0.438, in the 3rd dimension from 0.780 to 0.573, and in the 4th dimension from 0.739 to 0.564. The communality values (h2) were higher than 50% for all items except for 'To adopt different strategies to solve problems' (40.7%) and 'To quarrel with others and lose temper' (46.5%). However, these items cannot be eliminated as they still have factor loadings of 0.510 and 0.573, respectively (Pestana & Gageiro, 2014). Regarding the distribution and grouping of items in relation to Sheu's (2002) original version, it should be noted that the items remained the same in the 1st dimension (Problem-solving behaviors) and the 3rd dimension (Avoidance behaviors). However, the 2nd dimension (Optimistic coping behaviors) now includes two items that were originally in the Transference behaviors dimension. Finally, the 4th dimension (Transference behaviors) included two items that were originally included in the Avoidance behaviors dimension. The items were regrouped based on an analytical process that considered the results of the statistical tests from the exploratory factor analysis presented in Table 2. Additionally, the interpretation of the items was combined with the designation of the behaviors of the four final dimensions proposed for the European Portuguese version. Cronbach's alpha was calculated for both the total scale and each of the four dimensions to measure internal consistency (Table 3). The total scale had a value of 0.668.

Table 3

Dimensions of the coping strategies in nursing students

	Cronbach's alpha	No. of items
Problem-solving behaviors	0.794	6
Optimistic coping behaviors	0.654	6
Avoidance behaviors	0.702	4
Transference behaviors	0.596	3

Discussion

The adaptation and validation of measurement instruments is a useful and effective process for making the most of resources and facilitating the comparison of data from diverse populations (Grove & Gray, 2022). This procedure involves translating existing measurement instruments to meet the specific needs and cultural nuances of the target population, while ensuring their reliability and accuracy (Beaton et al., 1998). One advantage of this approach is resource conservation. Rather than investing significant time, effort, and financial resources in creating new instruments for each population of interest, researchers can use well-established frameworks and methodologies. By adjusting and adapting the instruments, they can optimize their application in different contexts without compromising the quality of data collection. In addition, the validation process ensures that the adapted instruments are sound and reliable in measuring the intended constructs. By following the methodological procedures for translating and cross-culturally adapting instruments and measuring psychometric properties, researchers can verify the effectiveness of the instruments in accurately capturing the intended information. This validation stage is critical to establishing the credibility and soundness of the data obtained from these instruments, thereby strengthening the scientific rigor of the studies.

The process of adapting and validating the CBI was carried out on a sample of 113 students from the 4 years of an undergraduate nursing degree. While the instrument has been used internationally, not all authors have evaluated its psychometric properties. Most authors report using the instrument's four dimensions and assessing the internal consistency by calculating the Cronbach's alpha value for the total scale, obtaining different values. Alanazi et al. (2023) assessed the coping strategies used by nursing students during clinical practice in a sample of 332 students and obtained a Cronbach's alpha value of 0.839. Bhutun et al. (2021) assessed the coping strategies used by Finnish students (n = 253) at the end of their first and second clinical placements and obtained a Cronbach's alpha value of 0.74 for the total scale. Gutiérrez-Puertas et al. (2022) also used the CBI with a sample of 130 students and obtained a value of 0.85 for the total scale Mazalová et al. (2022) translated and adapted the instrument for use with a sample of 151 nursing students in Czechia and determined its internal consistency. The Cronbach's alpha value for the total scale in that study was 0.96 (Mazalová et al., 2022). The values obtained for the total scale reported above are higher than those found in this study, even though acceptable internal consistency values were obtained. More specifically, the Cronbach's Alpha values for the Optimistic Coping Behaviors and Transference Behaviors dimensions are marginal, which may be due to sample size (Bujang et al., 2018). All the studies mentioned above have larger sample sizes than the sample used in this study (n = 113).

The instrument used in this study has been validated for the Turkish language (Karaca et al., 2015). The authors of that study also obtained four dimensions that explain 49.84% of the variance and Cronbach's alpha values similar to the original scale. Ahmad et al. (2018) conducted a methodological study to evaluate the psychometric properties of the Arabic version of the CBI. They performed EFA and confirmatory factor analysis and concluded that a modified version of the instrument with 15 items grouped into three dimensions (problem-solving, avoidance, and stay optimistic) exhibits high levels of adequacy and strong item loadings. Therefore, they recommend its use. In this study, four dimensions were identified, although the items were redistributed. The names of the dimensions were retained because, although the items differ, they still fit the definition of each category. However, it is important to consider this aspect when comparing results. Although the 19 items from the original scale remain the same, their organization in the different dimensions differs.

The limitations of this study are the size and variability of the sample. Although the size was determined in advance, a larger sample would have made the results more robust. Additionally, the study was conducted in a single nursing school, so it is recommended that the instrument be applied in more diverse contexts.

Conclusion

The European Portuguese version of the CBI enables the identification of coping strategies used by nursing students. Its use in Portugal will provide new insights and facilitate comparison of results. By adhering to international recommendations for the translation and adaptation of health measurement instruments and by determining the psychometric properties of the instrument (construct validity and internal consistency), it

was possible to conclude that the European Portuguese version of the CBI is a valid and reliable tool. The results of its application will provide knowledge in this field and contribute to designing strategies to help students cope with stress, ultimately enhancing the quality of education.

Author contributions

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Software: Antunes, R.
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Writing - review and editing: Loureiro, F., Antunes, R., Antunes, V.

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