Resilience in Physicians: Contributions to the Validation of the European Portuguese Version of the Resilience Scale

Resiliência em Médicos: Contributos para a Validação da Versão Portuguesa da Escala de Resiliência

ARTIGO ORIGINAL

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ABSTRACT

Introduction: The aim of this study is to explore the validation of the Resilience Scale in its long and brief versions (25 items and 14 items). This instrument assesses the individual's ability to withstand stressors, thrive and make sense of vital challenges.

Material and Methods: The sample included 511 Portuguese physicians. Both versions were validated through the study of internal structure validity, reliability, and convergent validity. The validity of the internal structure was analysed using the principal component analysis technique. Reliability was verified by the internal consistency study. For convergent validity, the correlation coefficients between these versions of the Resilience Scale and other scales validated to measure depression, anxiety, stress, and life satisfaction were calculated.

Results: Both versions of Resilience Scale showed good internal consistency. For each of the versions, one factor was retained in the principal component analysis. Convergent validity was verified by significant positive correlations between Resilience Scale (25 and 14) and a life satisfaction scale and significant negative correlations between Resilience Scale and depression, anxiety, and stress subscales.

Discussion: The results show the one-dimensional character of both versions of the Resilience Scale and support their usefulness and validity in the physician's class.

Conclusion: This is the first validation study of this scale in a group of physicians. Its results are very satisfactory, and its use in this specific group is recommended.

Keywords: Physicians; Portugal; Psychometrics; Resilience, Psychological; Surveys and Questionnaires

RESUMO

Introdução: Este estudo visa explorar a validação da Escala de Resiliência (25 itens e 14 itens), nas suas versões longa e breve. Este instrumento avalia a capacidade de o indivíduo suportar os fatores de *stress*, de prosperar e dar sentido a desafios vitais.

Material e Métodos: A amostra integrou 511 médicos portugueses. Ambas as versões foram validadas através do estudo de validade de estrutura interna, de fiabilidade e de validade convergente. A validade de estrutura interna foi analisada através da técnica da análise de componentes principais. A fiabilidade foi verificada pelo estudo de consistência interna. Para a validade convergente, calculou-se os coeficientes de correlação entre estas versões da Escala de Resiliência e outras escalas validadas para medir depressão, ansiedade, *stress* e satisfação com a vida.

Resultados: Ambas as versões da Escala de Resiliência apresentaram boa consistência interna. Para cada uma das versões, optou-se pela análise de componentes principais a um fator. A validade convergente foi verificada por correlações positivas significativas entre a Escala de Resiliência 25 e Escala de Resiliência 14 e uma escala de satisfação com a vida e por correlações negativas significativas entre as duas versões da Escala de Resiliência e as subescalas de depressão, ansiedade e *stress*.

Discussão: Os resultados evidenciaram o caráter unidimensional das duas versões da Escala de Resiliência e apoiam a sua utilidade e validade na classe dos médicos.

Conclusão: Trata-se do primeiro estudo de validação desta escala num grupo de médicos. Os seus resultados são muito satisfatórios, recomendando-se o uso deste instrumento neste grupo específico.

Palavras-chave: Inquéritos e Questionários; Médicos; Portugal; Psicometria; Resiliência Psicológica

INTRODUCTION

The emergence of the salutogenic paradigm has given rise to the study of mental health protection factors and mechanisms.[1] In this trend, resilience has been one of the most investigated constructs.[2,3]

Resilience is defined by the American Psychological Association as the process of positive adjustment to adversity, trauma, tragedy, threats or significant sources of stress.[4] Although this definition is useful, some authors[5] maintain that it does not reflect the complex nature of resilience. For the authors, the determinants of the construct include a series of biological, psychosocial, and cultural factors that interact to determine how a person responds to experiences of

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stress. Resilience refers to the human capacity to face high-risk situations and regain socio-emotional balance[6] and involves beliefs, behaviours, thoughts and actions,[4] and is considered a variable that promotes individual adjustment and moderates the negative effects of stress.[7] In this perspective, resilience is a psychological process that can be triggered during certain moments of life, and is understood as a dynamic interaction between individual characteristics and the complexity of contexts.[5,8]

Resilience has been analysed not only in normative periods of transition (*e.g.*, entry into school, process of preparation for parenthood), but also in non-normative crisis situations, such as unemployment[9] and situations of severe stress following natural accidents or terrorism, for example[5]. In this line of thought, resilience is characterized as a changing and dynamic construct, in which subjects are not considered as resilient, but rather as being resilient,[10.11] being able to use intrapersonal and interpersonal resources to face the situation of stress/risk in a positive way.[5,12]

The study of resilience seems more pertinent when applied to environments that assume the existence of vulnerability and that require and present adaptive characteristics[2], such as healthcare institutions and healthcare professionals, given the continuous and significant situations of stress. There has been a growing interest lately in the professional group of physicians.[13-15] This trend can be justified by the fact that medicine is a rewarding and, at the same time, incredibly demanding career, resulting in high levels of anxiety,[16,17] stress, depression and burnout[15,16,18] and other physical problems such as inflammatory conditions and cardiovascular diseases.[19-21]

Indeed, healthcare professionals, particularly physicians, have to deal, on a daily basis, with multiple sources of stress closely associated with the nature of the profession. These include excessive workloads and demanding working hours (shifts with night work), often resulting in sleep deprivation.[22] The multiple functions they perform,[23,24] including organizational issues associated with communication and interaction with other professionals, clinical dilemmas, conflicts with patients,[25] the complexity of the doctor-patient relationship,[22] persistent contact with suffering and pain, constitute a wide range of stressors. This recurrent exposure can affect psycho-emotional and physical well-being and result in exhaustion,[26] but also jeopardize the professional care process itself.[27]

Exposure to risk factors does not definitively foresee a negative adjustment. However, when the number of risk factors (individual and environmental) is greater than the number of protective factors, individuals may, in the face of the accumulation of new stressful situations, develop exhaustion and both physical and emotional symptoms.[28]

Several studies developed with healthcare professionals describe resilience as a burnout protection factor[29] and as a variable that cushioned the impact of the negative effects of occupational stressors.[30,31]

Although there is no 'gold standard' resilience scale,[32] the Wagnild and Young's Resilience Scale[7,33] was the first scale to be developed and is one of the most widely used in research.[34]

Wagnild and Young, in the late 1980s, conducted a qualitative study in which they interviewed 24 elderly women who had successfully adapted to vulnerable situations. The analysis of the interviews allowed the construction of the Resilience Scale (RS). This instrument is self-reported and is comprised of 25 items. The scores range from 25 to 175 points, with the highest score indicating a high degree of resilience. The average score for ER was 147.91 points (SD= 16.85 points).[7] A score below 121 points is considered indicative of 'low resilience'; a score between 121 and 145 points is considered as 'moderate resilience'; and above 145 points is considered as 'high resilience'.[7] The reliability of the scale was high, with a Cronbach's alpha (α) of 0.91, and the corrected item-total correlations ranged from 0.37 to 0.75, with the majority scoring between 0.50 and 0.70. The PCA with varimax rotation showed five components: serenity, perseverance, self-confidence, sense of life and self-sufficiency.[33]

After this first study, Wagnilg and Young[33] conducted several studies with different samples (e.g., higher education students, graduate students, caregivers of people with Alzheimer's dementia, nulliparous mothers returning to work)[35] and the reliability and validity of the instrument was confirmed. However, Wagnild and Young[7] found ambiguities in the interpretation for factors 3, 4 and 5. The scarp chart showed the cut-off point between factors 1 and 2 and the remaining factors, and the factorial solution indicated two substantial factors. These results led the authors to opt for the two factors solution, with weights above 0.40 for each item, considering that they reflect the theoretical definition of resilience and support the validity of the resilience scale construct. Factor 1 ('personal competence') consists of 17 items and integrates qualities such as self-confidence, perseverance, independence, determination, and invincibility; and factor two ('acceptance of self and life') consists of eight items and integrates characteristics such as balance, flexibility and balanced perspective of life. These factors explained 44% of the total variance.[7] This tool evaluates the individual's ability to withstand stress factors, to thrive and to give meaning to vital challenges.

Wagnild[36] conducted a literature review on the resilience scale and identified its translation and validation in more than twelve countries. Its validity had been analysed with various population and age groups. In these studies, Cronbach's alpha values ranged from 0.72 to 0.94, attesting to good internal consistency.[36]

The RS, besides the long 25 item version -RS25, has a short version with 14 items -RS14[35] (items 2, 6, 7, 8, 9, 10, 13, 14, 15, 16, 17, 18, 21 and 23). The principal component analysis (PCA) with direct rotation *oblimin* revealed the existence of one factor, responsible for explaining 53% of the total variance, indicating a common underlying dimension. Cronbach's alpha was 0.93. The RS14 correlated strongly with the long version of the RS25 (r = 0.97, p < 0.001) and correlated moderately with a measure of depressive

symptoms (r = - 0.41) and a measure of life satisfaction (r = 0.37).[35]

Taking recent RS studies (long and short versions) as a reference, and although Wagnild and Young[7] originally addressed the multidimensionality of this scale, the RS is commonly used with an overall score.[35,37,38]

In the Portuguese context, three RS validations were found. One by Felgueiras *et al*,[39] from a sample of 215 adolescents between 10 and 16 years old; one by Oliveira and Machado,[40] with a sample of 451 higher education students between 18 and 26 years old; and another by Deep and Pereira,[41] with a sample of 365 individuals between 18 and 83 years old.

Felgueiras *et al*[39] concluded that the RS had satisfactory reliability and stability indicators for the 24 items (item five was excluded), with a Cronbach's alpha of 0.82 and a test correlation of 0.73 (p < 0.001). The validity of the construct was studied by the PCA with *varimax* rotation, resulting in five non-homogeneous factors. Although it explained 46% of the total variance, none of the factors corresponded to Wagnild and Young's theoretical proposal.[7] They also found that items six and 11 had low factor loadings (< 0.40) and item 13 had a negative factor loading and the 'self-sufficiency' factor had only two items. The named items had low correlations with the full scale and, if removed, would increase the RS's total reliability.

Moreover, Oliveira and Machado,[40] in the study of the metric properties of RS concluded that it was a reliable (α = 0.89), valid and sensitive instrument. The factor analysis forced to two factors according to the proposal of the authors of the instrument[7], explained only 37.8% of the total variance. In this sense, Oliveira and Machado[40] proceeded to a PCA, with *varimax* rotation, having obtained a distribution of the items by five factors that explained 52.5% of the total variance.

Finally, Deep and Pereira,[41] in the study of the metric properties of the RS concluded that the initial analyses suggested the existence of 6 factors that explained 56.7% of the variance. However, they followed the procedure of the original scale and obtained four factors, having eliminated two items (items 1 and 7), with a total explained variance of 47.2%, and with a Cronbach's alpha of 0.87 for 23 items.

The growing interest in the study of resilience as a protective and recovering health variable has refuted the need to develop evaluation scales to ensure its validity.[42] Therefore, the evaluation of the quality of these instruments with specific populations, such as physicians, is of fundamental importance. Moreover, medicine is one of the least researched healthcare subjects at this level.

Although the ER study is broad and allows confirming the good internal consistency of the instrument, some controversies remain regarding its factorial structure.

Given the arguments raised, the aim of this study is to contribute to the validation of the RS25, in its extensive form and in its reduced form (RS14) when applied to Portuguese physicians.

MATERIAL AND METHODS

This is a cross-sectional, quantitative and analytical study. This study consisted of the application of an online questionnaire shared by social networks, using the snowball technique, and supported by healthcare institutions and professional organizations. This questionnaire was composed by a socio-demographic and professional section along with a battery of scales. The sample was collected by snowball technique, from the 9th of May to the 8th June 2020 and includes 511 doctors residing in Portugal and the islands.

After a positive opinion from the Ethics Committee of the Faculty of Medicine of the University of Porto (Reference No. 184/2020, May 7th, 2020) the study was initiated.

The main objective of this study was the validation of the ER25 (long version[7], Portuguese version[40]) and ER14 (short version[35]). This validation consisted in two studies: validity and reliability analysis. The validation of the internal structure, the reliability and the convergent validity analysis were evaluated. Given the lack of consensus in the literature on the number of factors of the ER, the validation of the internal structure of the scales was performed through PCA with *varimax* rotation. For the extraction of common factors, three criteria were considered: the number of factors with eigenvalue higher than 1 (Kaiser's method), by observing the scarp chart and the number of factors with explained percentage of variance higher than 5%. To determine whether the sample is adequate for the PCA technique, the Keiser-Meyer-Olkin (KMO) measurement and the Bartlett's sphericity test were calculated.[43]

The reliability of the scales was studied through internal consistency, measured by the Cronbach's alpha coefficient (α),[44] the average inter-item correlation (mean of the correlations between items) and the corrected item-total correlation. Cronbach's alpha measures the interrelation between items of a one-dimensional scale or subscale[44] and values above 0.7 are considered acceptable.[42,45] The mean of the correlations between items should be between 0.15 and 0.5 to ensure that they measure the same construct and, on the other hand, are not redundant.[46] Each item must correlate with the total of the construct (item-total corrected correlation)[42] with values between 0.3 and 0.7. Effects of 'ceiling or 'floor' are present when more than 15% of respondents reach the theoretical maximum or minimum of the scale, respectively. The existence of these effects limits the validity of the scale and should therefore be verified.[47]

Regarding the convergent validity of the ER25 and ER14, correlations were calculated with scales that are theoretically related with resilience, as identified by the authors of the original resilience scale: DASS-Depression, DASS-Anxiety, DASS-Stress and Life Satisfaction.[35]

The Depression Anxiety Stress Scale (DASS)[48,49] consists of 21 items and is organized in three subscales: depression, anxiety and stress, with each subscale consisting of seven items. The subjects assess the extent to which they experienced each symptom during the last week on a 4-point scale of severity or frequency (0: "did not apply to

me at all" to 3 "applied to me often, or most of the time"). The results of each subscale are determined by the sum of the scores of the seven items. The scale provides three scores for the final score of each subscale, ranging from 0 to 21 points. The highest scores for each subscale correspond to more negative affective states. The Cronbach's alpha of the DASS scale in the Portuguese version,[49] revealed good internal consistency (depression: α = 0.85; anxiety: α = 0.74 and stress: α = 0.81).

The Life Satisfaction Scale[50.51] aims to assess the cognitive component of subjective well-being. It is an instrument made up of 5 items. Each item is a statement to which the respondent must assign a level of agreement, using a Likert scale of seven points (1: 'strongly disagree' to 7: 'strongly agree'). The scale was first adapted for the Portuguese population by Neto *et al*[52] (α = 0.78). Simões[51] repeated the scale's validation, reducing the response range from seven to five points (1: 'strongly disagree' to 5: 'strongly agree'), obtaining a Cronbach's alpha value of 0.77. The result of the scale is determined by the sum of the five items' scores, thus ranging from 5 to 25 points. High scores suggest greater life satisfaction.[51] This scale is characterized by acceptable and high internal consistency (original version: α = 0.87 and Portuguese version: α = 0.77).[50.51]

All data analyses were performed using the statistical software package SPSS, version 26.0 for Windows (IBM SPSS Inc.). The categorical variables were described by absolute and relative frequencies, n (%). The quantitative variables presented deviations from the normal distribution and were described by median and interquartile range, Med [Q1, Q3]. The normality of quantitative variables was evaluated using the respective histograms. Correlations were calculated using the Spearman correlation coefficient, *r*.

Values of $p \leq 0.05$ were considered significant.

RESULTS

A total of 511 physicians participated in the study (Table 1). The group consisted mainly of women (79.8%) and the median (1st quartile – 3rd quartile) age was 35 (29 - 43) years old. Most of the physicians were married or in a non-marital relationship (42.9%) and had no children (57.7%). Regarding the level of schooling, 62.6% of the participants had a master's degree. About 30% had between one and five years of professional experience, followed by 25.4% with more than 16 years and 24.1% between six and 10 years. Primary health care was the predominant group with about 44% of the professionals in the sample. It should also be noted that some participants were active in different groups. The description of the scales applied can also be found in Table 1.

ER25 validation

Internal consistency

In the ER25, the Cronbach's alpha coefficient was high (α = 0.937), increasing with the exclusion of items 11 and 12 (Table 2). The mean of correlations between items was 0.391, falling between the recommended range: 0.15 and 0.5. The item-total correlations ranged from 0.320 (item 11) to 0.737 (item 17), but most were between 0.5 and 0.7.

Regarding the effects of 'ceiling' and 'floor' for the full scale, 0% of the participants scored the minimum of the scale and only 0.4% had the maximum score, which supports the validity of the Portuguese version of the scale for the physician population.

Validity of the internal structure

The data obtained with the application of the Portuguese version of ER25 proved adequate for PCA (KMO = 0.943; $p < 0.001$).

In determining the number of factors to retain, explaining the relational structure of data, the Kaiser's method indicated four factors, which together explain about 59.3% of the total variance of data. The scarp chart suggests the extraction of three factors, which explain 55.2% of the variance. Applying the criterion of variance percentage, this suggests three factors. Since two of the three applied criteria indicated the extraction of three factors, this will be the factorization analysed in Table 3.

In this factorization to three factors, the lowest communality was 41.7% (item 14). As can be seen in Table 3, there are several items to saturate simultaneously in two factors with weights higher than 0.4, as is the case of items 4, 5, 8, 9, 15, 17, 21, 23 and 25, which creates ambiguity in the interpretation. Moreover, the option of associating the item with the factor in which it has a higher weight does not match the one shown in the literature, nor is it a logical distribution of factors, so it was chosen to force factorization to one factor (which was the solution by observation of the scarp chart).

The 1-factor PCA explained about 42.6% of the total variance of the data and it is item 11 that presents the lowest communality (10.7%). The factor weights varied between 0.326 and 0.776 (for items 11 and 10, respectively), as can be seen in column A of Table 4. Taking into account that in the analysis of internal consistency, the exclusion of item 11 would increase the value of Cronbach's alpha and, in this factorization, it is the item that presents the lowest communality, we chose to exclude item 11 and compute the PCA to 1 factor. This new one-dimensional structure explained a total of 43.98% of the total variance. In this case, it is item 12 that presents the lowest communality (15.8%). The factor loadings of the items varied from 0.397 (item 12) and 0.776 (item 10), as can be seen in column B of Table 4. The Cronbach's alpha value for these 24 items was 0.939. In this new formulation, the exclusion of item 12 would increase the value of Cronbach's alpha and this item presents a very low communality, hence item 12 was excluded and 1-factor-PCA was applied again. This new one-dimensional structure explained a total of 45.27% of the total variance. In this case, it is item 22 that presents the lowest communality (23.7%). The factor loadings of the items varied from 0.486 (item 22) and 0.780 (item 10), as can be seen in column C of Table 4. The Cronbach's alpha value for these 23 items was 0.941.

Table 1 – Sociodemographic characteristics of individuals and summary measures of the Scales of Resilience (ER25 and ER14), Depression, Anxiety and Stress (DASS) and Satisfaction with Life, applied to the sample of 511 physicians

Variables		n (%)
Sex, n(%)	Women	408 (79.8)
	Men	102 (20.0)
	Other	1 (0.2)
Age in years, n(%)	Under 35 years old	255 (49.9)
	Between 35 and 44 years old	141 (27.6)
	Between 45 and 54 years old	57 (11.2)
	Between 45 and 54 years old	50 (9.8)
	Over 65 years old	8 (1.6)
Marital status, n(%)	Single	219 (42.9)
	Married/ Non-marital relationship	257 (50.3)
	Divorced/ Separated	33 (6.5)
	Widow/ Widower	2 (0.4)
With children, n(%)	Yes	216 (42.3)
	No	295 (57.7)
Educational level, n(%)	Bachelor's degree	164 (32.1)
	Post-graduation/ Specialist	5 (1.0)
	Master's degree	320 (62.6)
	PhD	22 (4.3)
Years of professional experience, n(%)	Less than 1 year	25 (4.9)
	From 1 to 5 years	153 (29.9)
	From 6 to 10 years	123 (24.1)
	From 11 to 15 years	80 (15.7)
	More than 15 years	130 (25.4)
Work sectors, n(%)	Intensive care unit	39 (7.6)
	Emergency department	176 (34.4)
	In-hospital emergency	21 (4.1)
	Out-of-hospital emergency	12 (2.3)
	Primary health care	225 (44.0)
	Inpatient unit	189 (37.0)
	Primary care unit	17 (3.3)
	Operating room	66 (12.9)
	Private sector	66 (12.9)
	Unemployed	2 (0.4)
	Retired	2 (0.4)
ER25, M ± SD; Med [Q_1, Q_3]; min-max		131.2 ± 20.6; 134 [122; 145]; 37 - 175
ER14, M ± SD; Med [Q_1, Q_3]; min-max		76.7 ± 12.4; 79 [70; 85]; 22 - 98
DASS-depression, M ± SD; Med [Q_1, Q_3]; min-max		3.9 ± 4.4; 2 [1; 6]; 0 - 21
DASS-anxiety, M ± SD; Med [Q_1, Q_3]; min-max		2.8 ± 3.4; 2 [0; 4]; 0 - 17
DASS-stress, M ± SD; Med [Q_1, Q_3]; min-max		7.2 ± 4.6; 6 [4; 10]; 0 - 21
Satisfaction with Life, M ± SD; Med [Q_1, Q_3]; min-max		17.1 ± 4.1; 18 [14; 20]; 5 - 25

ER14 Validation

The same psychometric analyses were conducted for the short version of the ER14.

Internal consistency

In the ER14, the Cronbach's alpha coefficient obtained was high (α = 0.923). The mean of the correlations between items was 0.467, falling within the recommended range. The corrected item-total correlations ranged from 0.536

(item 7) to 0.751 (item 10), with the majority located between 0.6 and 0.7.

Validation of the internal structure

The data obtained with the application of the Portuguese version of ER14 proved adequate for PCA (KMO = 0.941; p < 0.001).

Regarding the extraction of factors by PCA, the scarp chart agreed with the Kaiser method suggesting the retention of only one factor, responsible for explaining about 50.9% of the total variance of the observed data. The criterion of the percentage of variance suggested the retention of four factors, which explained about 69.2% of the data variance. Since two of the three criteria indicate the extraction of one factor, this will be the proposed factorization, indicating a common underlying construct with factor loadings between 0.597 and 0.797, as can be observed in Table 5. The communalities varied between 0.356 and 0.636.

Convergent validity

According to the original study by Wagnild and Young[7] and the Wagnild Guide,[35] resilience must be negatively correlated with stress, anxiety and depression and must be positively correlated with life satisfaction.

In this study significant negative correlations of ER25 were found with the DASS-depression scale (r = -0.502; p < 0.001), with the DASS-stress scale (r = -0.399; p < 0.001) and with the DASS-anxiety scale (r = -0.341; p < 0.001) and a significant positive correlation with the Life Satisfaction scale (r = 0.446; p < 0.001), indicating convergent validity of the instrument in these health professionals.

Likewise, significant negative correlations of ER14 were found with the DASS-depression scale (r = -0.502; p < 0.001), with the DASS-stress scale (r = -0.366; p < 0.001) and with the DASS-anxiety scale (r = -0.323); p < 0.001) and a significant positive correlation with the Life Satisfaction scale (r = 0.463; p < 0.001), indicating convergent validity of the instrument in this group of physicians.

DISCUSSION

In this study, and based on a sample of physicians, the results found in the ER25 showed levels of resilience (M = 131.2) that are lower than those reported by Wagnild and Young[7] (M = 147.9), and by Deep and Pereira[41] (M = 132.4) in Portuguese adults, but higher compared to those reported by Felgueiras *et al*[39] in Portuguese adolescents

Table 2 – Item-total correlations corrected for the 25 items on the Resilience Scale and respective Cronbach's alpha values if the item at stake is excluded (n = 511 physicians)

	Corrected total item correlation	Cronbach's alpha if the item is excluded
1. When I make plans, I take them all the way.	0.584	0.935
2. I usually solve what I need, one way or another.	0.654	0.934
3. I can count on myself more than most people.	0.556	0.935
4. It's important to me to keep an interest in things.	0.575	0.935
5. When necessary, I'm able to be on my own.	0.634	0.934
6. I'm proud to have achieved things in life.	0.661	0.934
7. I usually "randomly" do things.	0.526	0.935
8. I'm fine with myself.	0.691	0.933
9. I feel like I can handle several things at once.	0.699	0.933
10. I'm a determined person.	0.729	0.933
11. I rarely wonder about the meaning of things.	0.320	0.939
12. I live one day at a time.	0.396	0.938
13. I know I can get through hard times because I've been through hard times before.	0.572	0.935
14. I'm a self-disciplined person.	0.575	0.935
15. I stay interested in things.	0.728	0.933
16. I can laugh at things.	0.643	0.934
17. Believing in me helps me get through tough times.	0.737	0.932
18. In emergency situations, I'm someone you can trust.	0.620	0.934
19. I can usually look at a situation from various perspectives.	0.654	0.934
20. Sometimes I make myself do things whether I want to or not.	0.485	0.936
21. My life has meaning.	0.654	0.934
22. I don't usually dwell on things I can't do anything about.	0.482	0.937
23. When I find myself in a difficult situation, I usually get out of it.	0.728	0.933
24. I have enough energy to do everything I have to do.	0.581	0.935
25. I can easily adapt to unforeseen situations.	0.632	0.934

Table 3 – Composition of the three factors of ER25, with indication of the factor weights of each item, obtained by the PCA (n = 511 physicians)

Items	Weights factor 1	Weights factor 2	Weights factor 3
1. When I make plans, I take them all the way.	**0.763**		
2. I usually solve what I need, one way or another.	**0.751**		
3. I can count on myself more than most people.	**0.612**		
6. I'm proud to have achieved things in life.	**0.605**		
7. I usually "randomly" do things.	**0.706**		
10. I'm a determined person.	**0.687**		
14. I'm a self-disciplined person.	**0.492**		
4. It's important to me to keep an interest in things.	**0.636**	0.404	
5. When necessary, I'm able to be on my own.	**0.568**	0.517	
9. I feel like I can handle several things at once.	**0.535**		0.469
17. Believing in me helps me get through tough times.	**0.486**	0.427	0.427
15. I stay interested in things	**0.480**	0.415	0.435
13. I know I can get through hard times because I've been through hard times before.		**0.587**	
16. I can laugh at things		**0.601**	
18. In emergency situations, I'm someone you can trust.		**0.696**	
19. I can usually look at a situation from various perspectives.		**0.727**	
20. Sometimes I make myself do things, whether I want to or not.		**0.661**	
25. I have no problem with people not liking me.		**0.570**	0.462
23. When I find myself in a difficult situation, I usually get out of it.		**0.529**	0.401
22. I don't usually dwell on things I can't do anything about.			**0.664**
24. I have enough energy to do everything I have to do.			**0.666**
11. I rarely wonder about the meaning of things.			**0.663**
12. I live one day at a time.			**0.514**
8. I'm fine with myself.	0.494		**0.627**
21. My life has meaning.	0.400		**0.466**

(M = 126.7).

As for psychometric validation, Cronbach's alpha was 0.941 for 23 items (with removal of items 11 and 12, because they have factor loadings < 0.40), and 0.923 for 14 items (ER14), suggesting excellent internal consistency, stable reliability and homogeneity. This value is above the values presented by Wagnild and Young[7] (α = 0.91), by Felgueiras *et al*[39](α = 0.82), Oliveira and Machado[40] (α = 0.89) and by Deep and Pereira[41] (α = 0.87).

Although the various adaptations of the ER25 confirm the good internal consistency of this instrument regarding its factorial structure, some controversies remain. There are studies that point to five factors,[40] to four.[41] to three,[54] to two[7] and to one factor.[34,35] In this study, when making an interpretation of the three factors that resulted from the *varimax* rotation, they did not clearly distinguish 'personal competence' and 'satisfaction of self and life',[7] nor were they adequate to other theoretical proposals made by the author.[7,35] Therefore, the decision was made to force the analysis to one single factor, which explained 45.27% of the total variance. It should also be noted that despite the ER author's proposed solution of two factors [7,35], they generally use the overall scores of the scale,[7,35] both for the ER25 and ER14.

As expected, ER25 and ER14 are highly correlated (r = 0.956; p < 0.001), which are in line with Wagnild and Young's[7] findings.

In terms of convergent validity, this was demonstrated by significant positive correlations between the two ER measurements and the Life Satisfaction scale and by significant negative correlations with depression, anxiety and stress, which confirms the theoretical proposal.[7] Therefore, it was found that the correlations between ER25 and ER14 and the constructs (anxiety, depression, stress and life satisfaction) theoretically linked to resilience had the expected direction and were statistically significant (p < 0.001). Finally, it should be noted that one of the highest correlations was with the Life Satisfaction scale, in which the individual evaluates his or her perception of life satisfaction regardless of the life events experienced. The same results were obtained by Pesce *et al*[53] and Wagnild and Young.[7]

CONCLUSION

The Resilience Scale (ER25 and ER14) assesses an individual's ability to withstand stress factors, thrive and give

Table 4 – Factorial weights of items in the ER25 in the PCA with 1 factor, in three situations: A - considering the 25 items; B - excluding item 11; and C - excluding items 11 and 12 (n = 511 physicians)

Items	A weights factor 1	B weights factor 1	C weights factor 1
1. When I make plans, I take them all the way.	0.635	0.637	0.642
2. I usually solve what I need, one way or another.	0.707	0.710	0.714
3. I can count on myself more than most people.	0.613	0.616	0.620
4. It's important to me to keep an interest in things.	0.642	0.649	0.653
5. When necessary, I'm able to be on my own.	0.687	0.691	0.692
6. I'm proud to have achieved things in life.	0.708	0.708	0.710
7. I usually "randomly" do things.	0.578	0.579	0.582
8. I'm fine with myself.	0.719	0.716	0.714
9. I feel like I can handle several things at once.	0.734	0.732	0.732
10. I'm a determined person.	0.776	0.776	0.780
11. I rarely wonder about the meaning of things.	0.326	-------	-------
12. I live one day at a time.	0.404	0.397	-------
13. I know I can get through hard times because I've been through hard times before.	0.607	0.608	0.600
14. I'm a self-disciplined person.	0.613	0.613	0.613
15. I stay interested in things.	0.765	0.767	0.766
16. I can laugh at things.	0.685	0.686	0.684
17. Believing in me helps me get through tough times.	0.773	0.772	0.774
18. In emergency situations, I'm someone you can trust.	0.673	0.676	0.678
19. I can usually look at a situation from various perspectives.	0.697	0.698	0.699
20. Sometimes I make myself do things whether I want to or not.	0.530	0.531	0.528
21. My life has meaning.	0.693	0.691	0.693
22. I don't usually dwell on things I can't do anything about.	0.500	0.493	0.486
23. When I find myself in a difficult situation, I usually get out of it.	0.761	0.762	0.763
24. I have enough energy to do everything I have to do.	0.604	0.600	0.597
25. I have no problem with people not liking me.	0.662	0.661	0.657

Table 5 – Factorial weights of the 14 items of the Resilience Scale (ER14), obtained by 1-factor PCA (n = 511 physicians)

Items	Weights factor
2. I usually solve what I need, one way or another.	0.697
6. I'm proud to have achieved things in life.	0.722
7. I usually "randomly" do things.	0.597
8. I'm fine with myself.	0.742
9. I feel like I can handle several things at once.	0.740
10. I'm a determined person.	0.797
13. I know I can get through hard times because I've been through hard times before.	0.603
14. I'm a self-disciplined person.	0.640
15. I stay interested in things.	0.786
16. I can laugh at things.	0.691
17. Believing in me helps me get through tough times.	0.795
18. In emergency situations, I'm someone you can trust.	0.666
21. My life has meaning.	0.718
23. When I find myself in a difficult situation, I usually get out of it.	0.754

meaning to vital challenges. With this tool it is possible to perform an assessment of this ability and provide relevant information to the individual. Similarly, the study of resilience allows the identification of protective factors that can guide intervention programmes to develop psychosocial skills and resources to help the individual cope with adversity.

Based on the psychometric properties obtained, our study supports the usefulness of ER25 (long Portuguese version) and RS14 (short Portuguese version) for assessing resilience in physicians in the Portuguese context.

This study allowed to verify the good psychometric qualities of the ER25 and ER14 scale in a Portuguese sample of physicians. In the future, this version should be applied to other healthcare professionals, especially those who develop their professional activity in more adverse contexts, in order to assess their psychometric characteristics compared with the findings described here.

AUTHORS CONTRIBUTION

CS: Conception and design of the work, acquisition, analysis and interpretation of data, supervision and critical review of the paper.

LC: Statistics analysis, acquisition, analysis and interpretation of data, critical review of the paper.

AT: Statistics analysis, acquisition, analysis and interpretation of data, critical review of the paper.

ARR: Analysis and interpretation of data, critical review of the paper.

ID: Conception and design of the work, funds raise, supervision and critical review of the paper.

PROTECTION OF PEOPLE AND ANIMALS

The authors declare that all ethical assumptions in accordance with the Declaration of Helsinki (2013) and the Convention for the Protection of Human Rights and Dignity of the Human Being in relation to the Applications of Biology and Medicine (2001) have been fulfilled.

DATA PRIVACY

The authors declare to have followed the protocols of the Faculty of Medicine of the University of Porto regarding the publication of data.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest related to this work.

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REFERENCES

1. Hjemdal O, Aune T, Reinfjell T, Stiles T, Friborg O. Resilience as a predictor of depressive symptoms: a correlational study with young adolescents. Clin Child Psychol Psychiatry. 2007;12:91-104.
2. Cordovil C, Crujo M, Vilariça P, Caldeira da Silva P. Resiliência em crianças e adolescentes institucionalizados. Acta Med Port. 2011;24:S413-8.
3. Rushton C, Batcheller J, Schroeder K, Donohue P. Burnout and resilience among nurses practicing in high-intensity settings. Am J Crit Care. 2015;24: 412-20.
4. American Psychological Association. The road to resilience. Washington: American Psychological Association; 2014.
5. Southwick SM, Bonanno GA, Masten AS, Panter-Brick C, Yehuda R. Resilience definitions, theory, and challenges: Interdisciplinary perspectives. Eur J Psychotraumatol. 2014;5:1-14.
6. Melillo A, Ojeda E. Resiliência: descobrindo as próprias fortalezas. Porto Alegre: Artmed; 2005.
7. Wagnild G, Young H. Development and psychometric evaluation of the resilience scale. J Nurs Meas. 1993;1:165–78.
8. Poletto M, Koller SH. Contextos ecológicos: promotores de resiliência, fatores de risco e de proteção. Estud Psicol. 2008;25:405-16.
9. Norris FH, Friedman MJ, Watson PJ, Byrne CM, Diaz E, Kaniasty K. 60,000 disaster victims speak: part I. An empirical review of the empirical literature, 1981–2001. Psychiatry. 2002;65:207-39.
10. Angst R. Psicologia e resiliência: uma revisão da literatura. Psicol Argum. 2009;27:253-60.
11. Serrão C, Duarte I, Castro L, Teixeira A. Burnout and depression in Portuguese healthcare workers during the COVID-19 pandemic—the mediating role of psychological resilience. Int J Environ Res Public Health 2021;18:636-50.
12. Pietrzak RH, Southwick SM. Psychological resilience in OEF-OIF veterans: application of a novel classification approach and examination of demographic and psychosocial correlates. J Affect Disord. 2011;133:560-8.
13. McCain RS, McKinley N, Dempster M, Campbell WJ, Kirk SJ. A study of the relationship between resilience, burnout and coping strategies in doctors. Postgrad Med J. 2018;94:43-7.
14. McKinley N, Karayiannis PN, Convie L, Clarke M, Kirk SJ, Campbell WJ. Resilience in medical doctors: a systematic review. Postgrad Med J. 2019;95:140-7.
15. McKinley N, McCain RS, Convie L, Clarke M, Dempster M, Campbell WJ, et al. Resilience, burnout and coping mechanisms in UK doctors: a cross-sectional study. BMJ Open. 2020;10:1-8.
16. Creedy DK, Sidebotham M, Gamble J, Pallant J, Fenwick J. Prevalence of burnout, depression, anxiety and stress in Australian midwives: a cross-sectional survey. BMC Pregnancy Childbirth. 2017;17:1-8.
17. Yahaya S, Wahab S, Yusoff M, Yasin M, Rahman M. Prevalence and associated factors of stress, anxiety and depression among emergency medical officers in Malaysian hospitals. World J Emerg Med. 2018;9:178-86.
18. Wilkinson E. UK NHS staff: stressed, exhausted, burnt out. Lancet. 2015;385:841-2.
19. Karatoreos IN, Mcewen BS. Annual research review: the neurobiology and physiology of resilience and adaptation across the life course. J Child Psychol Psychiatry. 2013;54:337-47.
20. Russo S, Murrough J, Han M, Charney S, Nestler E. Neurobiology of resilience. Nat Neurosci. 2012;15:1475-84.
21. Southwick S, Charney D. The science of resilience: Implications for the prevention and treatment of depression. Science. 2012;338:79-82.
22. Garbarino S, Lanteri P, Durando P, Magnavita N, Sannita WG. Co-morbidity, mortality, quality of life and the healthcare/welfare/social costs of disordered sleep: a rapid review. Int J Environ Res Public Health. 2016;13:1-15.
23. Lambert V, Lambert C, Itano J, Inouye J, Kim S, Kuniviktikul W, et al. Cross-cultural comparison of workplace stressors, ways of coping and demographic characteristics as predictors of physical and mental health among hospital nurses in Japan, Thailand, South Korea and the USA (Hawaii). Int J Nurs Stud. 2004;41:671-84.
24. Lim J, Hepworth J, Bogossian F. A qualitative analysis of stress, uplifts and coping in the personal and professional lives of Singaporean nurses. J Adv Nurs. 2011;67:1022-33.
25. Jackson D, Firtko A, Edenborough M. Personal resilience as a strategy for surviving and thriving in the face of workplace adversity: a literature review. J Adv Nurs. 2007;60:1–9.
26. Stamm BH. The Concise ProQOL Manual. 2nd ed. Pocatello: ProQOL.org; 2010.
27. Barnett J, Baker E, Elman N, Schoener G. In pursuit of wellness: the

self-care imperative. Prof Psychol Res Pract. 2007;38:603-12.
28. Schilling E, Aseltine R, Gore S. The impact of cumulative childhood adversity on young adult mental health: measures, models, and interpretations. Soc Sci Med. 2008;66:1140–51.
29. Keeton K, Fenner D, Johnson T, Hayward R. Predictors of physician career satisfaction, work-life balance, and burnout. Obstet Gynecol. 2007;109:949–55.
30. Arrogante O, Aparicio-Zaldivar E. Burnout and health among critical care professionals: the mediational role of resilience. Intensive Crit Care Nurs. 2017;42:110-5.
31. Colville G, Smith J, Brierley J, Citron K, Nguru N, Shaunak P, et al. Coping with staff burnout and work-related posttraumatic stress in intensive care. Pediatr Crit Care Med. 2017;18:e267-73.
32. Almeida M, Dias S, Zavier M, Torgal J. Validação exploratória e confirmatória da escala de resiliência Connor-Davidson (CD-RISC-10) numa amostra de inscritos em centros de emprego. Acta Med Port. 2020;33:124-32.
33. Wagnild G, Young H. Resilience among older women. Image J Nurs Scholarsh. 1990;22:252-5.
34. Pinheiro M, Matos A. Exploring the construct validity of the two versions of the resilience scale in a Portuguese adolescent sample. EJSBS. 2013;2:178-89.
35. Wagnild G. The resilience Scale user's guide for the US English version of the resilience scale and the 14-item resilience scale. Worden: Resilience Center; 2009.
36. Wagnild G. A review of the resilience scale. J Nurs Meas. 2009;17:105–13.
37. Black C, Ford-Gilboe M. Adolescent mothers: resilience, family health work and health-promoting factors. J Adv Nurs. 2004;48:351-60.
38. Hunter AJ, Chandler G. Adolescent resilience. Image J Nurs Scholarsh. 1999;31:243-47.
39. Felgueiras M, Festas C, Vieira M. Adaptação e validação da resilience scale de Wagnild e Young para a cultura portuguesa. Cad Saúde. 2010;3:73-80.
40. Oliveira M, Machado T. Tradução e validação da escala de resiliência para estudantes do ensino superior. Anal Psicol. 2011;4:579-91.
41. Deep C, Leal I. Adaptação da "The Resilience Scale" para a população adulta portuguesa. Psicol USP. 2012;23:417 – 33.
42. Streiner D, Norman R, Cairney J. Health measurement scales: a practical guide to their development and use. 5th ed. Oxford: Oxford University Press; 2014.
43. Marôco J. Análise estatística com o SPSS statistics. 6th ed. Pêro Pinheiro: ReportNumber. Lisboa; 2014.
44. Mokkink L, Terwee C, Patrick D, Alonso J, Stratford P, Knol D, et al. The COSMIN study reached international consensus on taxonomy, terminology, and definitions of measurement properties for health-related patient-reported outcomes. J Clin Epidemiol. 2010;63:737-45.
45. Nunnally JC. Psychometric theory. McGraw-Hill: New York; 1978.
46. Clarck L, Watson D. Constructing validity: basic issues in objective scale development. Psychol Assess. 1995;7:309-19.
47. Terwee C, Bot S, De Boer M, Van der Windt D, Knol D, Dekker J, et al. Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol. 2007;60:34-42,
48. Lovibond P, Lovibond S. The structure of negative emotional states: comparison of the depression anxiety stress scales (DASS) with the Beck depression and anxiety inventories. Behav Res Ther. 1995;33:335-43.
49. Pais-Ribeiro JL, Honrado A, Leal I. Contribuição para o estudo da adaptação portuguesa das escalas de ansiedade, depressão e stress (EADS) de 21 itens de Lovibond e Lovibond. Psic Saúde Doenças. 2004;5:229-39.
50. Diener ED, Emmons RA, Larsen RJ, Griffin S. The satisfaction with life scale. J Pers Assess. 1985;49:71–5.
51. Simões A. Ulterior validação de uma escala de satisfação com a vida (SWLS). Rev Port Pedagogia. 1992;26:503-15.
52. Neto F, Barros J, Barros A. Satisfação com a vida. In: Almeida L, Santiago R, Silva P, Caetano O, Marques J, editors. A ação educativa: análise psicossocial. Leiria: ESEL/APPORT; 1990. p.105-17.
53. Pesce RP, Assis S, Avanci JQ, Santos NC, Malaquias JV, Carvalhaes R. Adaptação transcultural, confiabilidade e validade da escala de resiliência. Cad Saúde Pública. 2005;21:436-48.