

Article

Development and Psychometric Properties of a Scale to Measure Resilience among Portuguese University Students: Resilience Scale-10

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Abstract: Higher education students lack skills to deal in a positive way with the crises inherent to the developmental phase in which they find themselves. However, the complexity of the current global context adds an urgent need for them to be resilient. For this purpose, it is necessary to evaluate their capacity for resilience, which requires the use of instruments that are easy to access, useful, simple, and fast. In this sense, this study aimed to develop and validate a scale to assess students' resilience in the face of adversity. The scale was administered to a sample of 2030 Portuguese higher education students. The results obtained pointed towards a factorial structure composed of two factors named "self-determination" and "adaptability", which showed good internal consistency. Therefore, this scale proved to be a valid measure to assess resilience among the university population. Future studies may consider this variable as an intervention target since it can be a predictor of success in phases of change and crisis.



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1. Introduction

Given the continuous transformation of society and the unpredictability of its future, knowing how to deal with adversities has become an essential competence to survive healthy and with quality. This capacity, called resilience, has gained relevance in scientific research [1–6].

The resilience has been defined from different perspectives: As an interactive concept which is concerned with the combination of serious risk experiences and a relatively positive psychological outcome despite those experiences [7]; as a universal capacity that allows a person, group or community to prevent, minimize or overcome the harmful effects of adversity [8,9]; as the capacity of a dynamic system to adapt successfully to disturbances that threaten the system function, viability, or development [10]; as the outcome from negotiations between individuals and their environments for the resources to define themselves as healthy amidst conditions collectively viewed as adverse [11]; and also as the "ability to use knowledge, attitudes and skills in order to prevent, minimize or overcome the harmful effects of crises and adversities" [2] (p. 167). Therefore, a resilient person, facing a stressful or adverse situation, manages to use his or her personal resources by adopting behaviors that help being successful in that circumstance.

If the complexity of the current global context calls for psychological support for the general population [12], in the case of higher education students, the need for this competence is further justified by the fact that they have to face the crises inherent to the developmental stage in which they find themselves, and the obstacles of the education system itself, as well as the unpredictability of the labor market, in which they will soon be integrated [13–16].

Previous studies point towards the need to promote this capacity among higher education students as it facilitates adaptation to changes and ambiguous situations, the recovery from exhausting and tiring conditions, as well as the proficiency in maintaining a calm, clarity of objectives and guidance in hostile situations. Additionally, it enables the student to think strategically and make appropriate decisions in times of pressure, to perform complex tasks, and to adopt flexible behaviors in problem solving. In this domain, several intervention programs have been evaluated as effective [17–19]. For example, the program You Can Do It! [18], which has been widely applied in multiple Australian schools, presents resilience as the basis for social and emotional learning. Nevertheless, research indicates that the effectiveness of a program depends a lot on the type of activities implemented [19]. Therefore, resilience is a concept that should continue to be investigated, so that the programs made available to young students include pedagogical strategies and resources more oriented to the promotion of this capacity.

In order to assess resilience and determine the criteria for the functioning of the resilient person, several scales have been developed and validated [3,20–25]. Most of the existing scales use mainly clinical criteria, as proposed by Anaut [17,18]: The level of anxiety and depression, the level of social competence, school and intellectual success, and clinical symptoms. Therefore, they focus on behavioral and cognitive assessments, personality traits, and psychological disorders. In turn, Sætren et al. [20] (p. 3) proposed an evaluation through the “three-factor model of personal resiliency”, that reflects aspects of the individual’s personal experience in three dimensions of his or her own development: “Sense of mastery, sense of relatedness, and emotional reactivity”. Another instrument also used to assess resilience is the one by Prince-Embury [25], called resiliency scales for children and adolescents (RSCA), which assesses psychological symptoms and psychological status. RSCA comprises three scales: Sense of control—assesses personal attributes such as optimism, self-efficacy, and adaptability; relationship capacity—assesses trust, support, comfort, and tolerance; and emotional reactivity—assesses sensitivity, recovery, and injury.

Therefore, most of the aforementioned instruments address resilience at the clinical level, with predominance to traumatic and health situations of children and adolescents. Additionally, they are often complex scales in terms of completion and interpretation, which makes both application and accessibility difficult in contexts where a large number of individuals need to be evaluated, as in the case of higher education. In order to bridge this gap, we aimed to develop and assess the psychometric proprieties of a new self-assessment scale—resilience scale-10 (RS-10)—to measure resilience in a non-clinical community. More specifically, the purposes of this study were to (i) develop a brief measure of resilience appropriate for university students; and (ii) examine the factor structure and reliability of this scale.

2. Methods

2.1. Development of the Portuguese Version of the RS-10

This study consisted of two phases, beginning with the scale development phase aiming at identifying the appropriate items to include in a self-report measure. A set of items related to resilience was collected, considering the following parameters: Knowledge obtained in the literature; objectives of the instrument to be built; population to be evaluated; dimensions of the construct to be evaluated; and behavioral aspects of the construct to be included in the evaluation [26]. Additionally, in order to define the RS-10 items, we used as a reference the questionnaires developed by Grotberg [8,26] and Anaut [1,19]. Based on this process, 30 initial items were obtained. These 30 items were presented to a panel of experts with seven researchers/university professors in the areas of psychology, education, and management, obtaining a reduced final version including only 10 items. The 10 selected items were included since they were more directly related to the ability to deal with adversities in daily life, without a focus on traumatic situations. This version went through a process of spoken reflection carried out with a class of 3rd year students from a private university in Porto, consisting of 22 students (7 male and 15 female). These

participants were instructed to report their subjective perception of personal skills to face adversity. Each item was answered using a 5-point (1 = never; 2 = rarely; 3 = sometimes; 4 = almost always; 5 = always) response scale, so possible scores ranged from 10 to 50. Higher scores indicated a higher level of resilience. The application of the questionnaire lasted approximately 10 min and, subsequently, questions related to the instructions for completing the instrument, suitability of the included items, order of the items, and eventual doubts related to the semantics were discussed with the students (see the final version in Table 1; see also Appendix A). Thereafter, the scale's psychometric properties were assessed using a sample of Portuguese higher education students.

Table 1. Description of the items of the resilience scale-10 (RS-10).

Item	Portuguese Version	English Translation
1	Sinto que me conheço bem.	I feel I know myself well.
2	Gosto de mim como sou.	I like myself just as I am.
3	Julgo ter capacidades para ser bem-sucedido na vida.	I think I have the necessary skills to be successful in life.
4	Sinto-me bem com o corpo que tenho.	I feel comfortable with my body.
5	Sinto que tenho uma boa autoestima.	I feel I have good self-esteem.
6	Tenho total confiança nas minhas capacidades para resolver os meus problemas.	I have total confidence in my skills to solve my problems.
7	Tenho conseguido superar as adversidades que a vida me tem colocado.	I have been successful in overcoming difficulties in life.
8	Consigo minimizar os efeitos negativos das adversidades.	I manage to minimize the negative effects of difficulties.
9	Assumo os meus problemas, dando-lhes a importância que têm, sem os subvalorizar ou sobrevalorizar.	I take on my problems, giving them the importance they have, without undervaluing or overvaluing them.
10	Quando uma situação não é passível de ser mudada, aceito esse facto com serenidade.	When a situation cannot be changed, I accept that fact with serenity.

2.2. Validating the RS-10: Sample

The sample included 2030 Portuguese university students over 18 years old ($M = 21.11$; $SD = 2.00$; range: 18–26 years) and the majority were female (77.1%). Students were recruited from several Portuguese Higher Education institutions. Most university students were based in higher education institutions located in the North of Portugal (51.5%). Participants attended different training areas, namely social sciences (59.8%), education, health and tertiary services (33.1%), and exact sciences such as engineering, computer science, mathematics, building and agriculture, and transformation industry (7.1%). Among the students, 71.8% were undergraduates and 28.2% were master students. This study has been carried out in accordance with the Declaration of Helsinki and informed consent was obtained from all the participants.

3. Data Analysis and Results

3.1. Properties of Items

A preliminary analysis was conducted in order to assess descriptive statistics, normality, and non-multicollinearity at the item level (see Table 2). The mean response for the 10 items was 3.62 ($SD = 0.20$). No deviations from the normal distribution were found, as the kurtosis and skewness scores for each item fell within -2 and 2 . All the items presented significant positive corrected item-total correlations (≥ 0.42). The internal consistency of

the total scale was good ($\alpha = 0.866$) and there was a low variation in reliability if items were deleted. All inter-correlations among all the items were below 0.65 suggesting no multicollinearity. Based on this, all the items were retained from subsequent analyses.

Table 2. Descriptive statistics ($n = 2030$).

Item	M	SD	Skewness	Kurtosis	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1	3.76	0.86	−0.481	0.205	0.505	0.860
2	3.82	0.84	−0.441	−0.120	0.682	0.845
3	3.80	0.73	−0.268	−0.202	0.593	0.853
4	3.60	0.98	−0.498	−0.001	0.552	0.857
5	3.49	0.89	−0.469	0.183	0.705	0.843
6	3.54	0.83	−0.149	−0.111	0.686	0.845
7	3.92	0.74	−0.390	0.188	0.525	0.858
8	3.49	0.79	−0.140	0.189	0.598	0.852
9	3.54	0.87	−0.125	−0.202	0.565	0.855
10	3.25	0.86	−0.040	0.020	0.420	0.867

3.2. Factorial Validity

To test the factorial structure of the RS-10, a combination of the principal components analysis (PCA) and confirmatory factor analysis (CFA) was conducted. The sample was randomly split into two samples through the randomization function on the Statistical Package for Social Sciences, version 24 (SPSS Inc., Chicago, IL, USA), resulting in 2030 observations in total, 791 for the PCA and 1239 for the CFA.

PCA using the oblique rotation method suggested a two-factor structure. The Kaiser-Meyer-Olkin (KMO) measure presented a value of 0.897 and Barlett's test of sphericity was significant ($\chi^2 = 3412.112$, $p < 0.001$). Factor 1 comprised items 1, 2, 3, 4, and 5 (5 items), which we termed as "self-determination", based on the three sources of resilience features labelled by Grotberg [8]. Factor 2 included five items (6, 7, 8, and 9, 10), which we termed as "adaptability". These two factors explained together 60.70% of the total variance. Table 3 shows the factor loadings (>0.60) and communalities (>0.40). Additionally, a good internal consistency for each factor was estimated (Factor 1: Cronbach's $\alpha = 0.843$; Factor 2: Cronbach's $\alpha = 0.813$).

Table 3. Factors extracted from the principal components analysis (database 1; $n = 791$).

Item (Item No.)	Factor 1 Self-Determination	Factor 2 Adaptability	h^2
1	0.636		0.418
2	0.866		0.743
3	0.734		0.576
4	0.854		0.647
5	0.774		0.743
6		0.619	0.657
7		0.730	0.568
8		0.792	0.673
9		0.786	0.607
10		0.705	0.437

The two-factor model derived from PCA was then cross-validated. Mardia's kurtosis coefficient of 20.95 with a critical ratio of 23.80 indicated that the data were multivariate non-normal. Therefore, CFA was performed using the maximum likelihood estimation (ML) with bootstrapping (1000 resamples) to generate accurate estimations of standard errors with accompanying confidence intervals (bias-corrected at the 95% confidence level). To assess the overall model fit, we use the following parameters: Root mean square error of approximation (RMSEA), comparative fit index (CFI), and the standardized root mean

square residual (SRMR). The criteria for an acceptable model fit were $CFI \geq 0.95$; $RMSEA \leq 0.10$ [27], and $SRMR \leq 0.08$ [28]. The chi-square test (χ^2) was reported, but not used to check the model fit due to its sensibility to large samples [29]. Data obtained from the CFA showed that the two-factor model fitted well descriptively ($CFI = 0.957$; $RMSEA = 0.068$ (90% CI 0.059–0.076); $SRMR = 0.040$). All the standardized factor loadings (see Figure 1) of the item parcels were statistically significant showing that question items were good indicators for each factor.

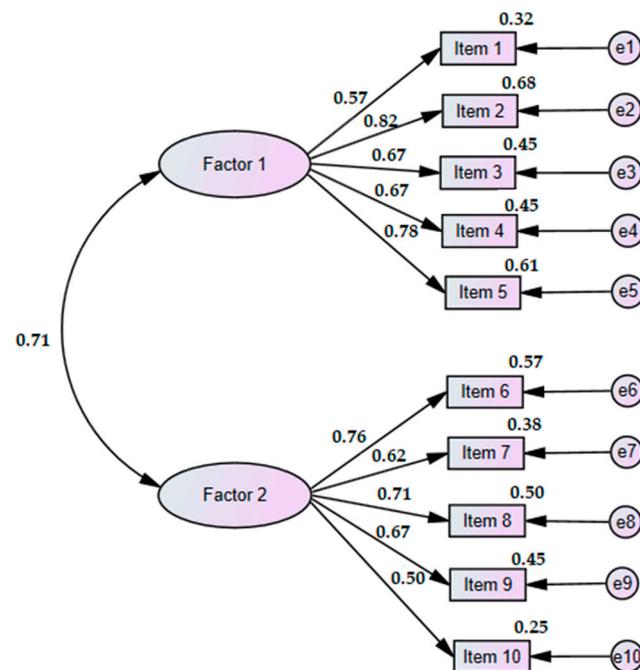


Figure 1. Confirmatory factor analysis: Two-factor solution using a part of the sample (database 2; $n = 1239$).

4. Discussion and Conclusions

Universities normally have to prepare students to face the multiple difficulties they have to face, both in academia and in the subsequent period of integration in the labor market. However, there are deficiencies regarding the acquisition of skills appropriate to face these challenges [16,30–32]. In times of crisis, as experienced globally today, these are even more evident.

In order to carry out an effective intervention in this domain, it is important to evaluate each student individually in order to activate different strategies for them. This argument supported the need to develop a brief and accessible measure for the assessment of resilience in higher education students identifying the degree of their ability to cope with adversity. Our analysis showed that RS-10 is a valid measure and can contribute to the understanding of the perception of personal skills to face adversity among university students. The scale demonstrated a meaningful and strong factor structure, with items effectively measuring the factors, as shown by the loadings. According to the results, the two-factor model identified in the factor analysis indicated that RS-10 can capture the dimensions of self-determination and adaptability that adequately summarize resilience.

With self-determination, despite the difficulties, obstacles, discouragements, and failures, the individual is sure to complete the previously outlined tasks. Therefore, self-determination allows goals to be achieved and personal projects and ambitions to be realized. In addition, according to several authors, both from the perspective of clinical psychology, organizations and human resources management, self-determination is decisive in carrying out projects, despite the obstacles [33–37].

In turn, adaptability means the ability to change, whenever necessary, the strategy in order to achieve the previously determined objective. As such, it presupposes mental flexibility and emotional plasticity in order to better face unpredictable and unexpected situations. This is a construct that explains the success of those entrepreneurs who identify opportunities and implement projects. Furthermore, it is a characteristic of societies where innovation predominates, such as the current one we live in. Moreover, according to recent research, flexibility is an essential construct to integrate work teams, to lead people in organizations, and to maintain adequate levels of health and well-being [36,38,39]. Similar to other scales, RS-10 has good internal consistency ($\alpha = 0.866$), with the factor referring to self-determination showing a Cronbach's $\alpha = 0.843$ and the factor relating to adaptability revealed a Cronbach's $\alpha = 0.813$. For example, the Portuguese version of the resilience scale of Wagnild and Young [19], composed of 25 items, which evaluates adolescents presented a Cronbach's alpha of 0.86, and the Brazilian version presented a Cronbach's alpha of 0.80 [23]. In turn, "The Multidimensional Teachers' Resilience Scale" [40] presents the following Cronbach's alpha values: Motivational = 0.78; emotional = 0.72; social = 0.74; professional = 0.75. Furthermore, the original version of the Brief Resilience Scale [18] demonstrated good internal consistency, with Cronbach's alpha values between 0.80 and 0.91. Although the RS-10 shows promising psychometric properties, the scale's overall validity needs to be interpreted in the light of potential limitations. First, the main limitation of this study has to do with the sample, which is only Portuguese, thus we suggest a transcultural validation. Furthermore, the Portuguese version of this self-reporting tool must be translated and validated in other languages. Second, there was no assessment of the reproducibility/repeatability. In addition, an important next step is to assess the convergent validity of the RS-10 through the correlations of the scale with theoretically related constructs such as self-efficacy [33,40] and self-esteem [41,42].

Perceived self-efficacy while as a positive belief allows you to carry out new or difficult tasks in order to obtain desired results. This vision of self-confidence, associated with self-control allows us to deal with stress-inducing situations and promote resilience.

Overall, the RS-10 was developed with input from university students and is a quick-response instrument appropriate for use across different training areas and degree levels. However, the generalizability of the study results should be better established in future studies in additional settings. Despite this, the study presents opportunities for empirical studies in the field of resilience and we believe that the use of this instrument in clinical practice may contribute to intervene effectively next to students, promoting their capacity for self-determination and adaptability, which are crucial to face the adversities inherent to human nature and the evolutionary dynamics of the history of society.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author [J.J.], upon reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Resilience scale-10 (RS-10) (Jacinto Jardim, Anabela Pereira, and Ana Bártolo, 2021) *.

		1	2	3	4	5
1	I feel I know myself well.					
2	I like myself just as I am.					
3	I think I have the necessary skills to be successful in life.					
4	I feel comfortable with my body.					
5	I feel I have good self-esteem.					
6	I have total confidence in my skills to solve my problems.					
7	I have been successful in overcoming difficulties in life.					
8	I manage to minimize the negative effects of difficulties.					
9	I take on my problems, giving them the importance they have, without undervaluing or overvaluing them.					
10	When a situation cannot be changed, I accept that fact with serenity.					

The following sentences refer to a variety of skills one may think to possess to a smaller or larger degree. Please rate each sentence considering how frequently you think in the way it describes, using the following rating scale: 1 = never; 2 = rarely; 3 = sometimes; 4 = almost always; 5 = always. * Authorization to use this instrument should be asked from jacinto.jardim@uab.pt.

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