Validation of the Regret Coping Scale for Healthcare Professionals (RCS-HCP) in Portuguese for Brazil

Fabiana Rosa Neves Smiderle

Escola Superior de Ciências da Santa Casa de Misericórdia de Vitória Faculdade de Medicina: Escola Superior de Ciências da Santa Casa de Misericórdia de Vitória Faculdade de Medicina

<https://orcid.org/0000-0001-5624-6673>

Valmin Ramos-Silva

Escola Superior de Ciências da Santa Casa de Misericórdia de Vitória Faculdade de Medicina: Escola Superior de Ciências da Santa Casa de Misericórdia de Vitória Faculdade de Medicina

Stela Maris de Jesus Castro

Universidade Federal do Rio Grande do Sul

Delphine Sophie Courvoisier

Hôpitaux Universitaires Genève: Hopitaux Universitaires Geneve

Rita Mattiello (✉ rita.mattiello@pucrs.br)

Pontifícia Universidade Católica <https://orcid.org/0000-0002-0548-3342>

Research

Keywords: Validation Studies, Health Personnel, Emotions, Psychological adaptation

Posted Date: May 14th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-502302/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Background: Assessment of the ability to cope with regret can contribute to support strategies for health professionals. However, in Brazil, there are few instruments that evaluate this ability in the general context. The aim of the study was to adapt and validate the Regret Coping Scale for Healthcare Professionals (RCS-HCP) for Brazilian health professionals.

Methods: This is a cross-sectional study carried out with professionals linked to tertiary care hospital institutions. In the validation, the instruments were translated, and the psychometric properties were evaluated for validity and reliability. Validity was assessed using the following validities: content (judges' evaluation), criterion (correlation with Satisfaction With Life Scale – SWLS and Self-Reporting Questionnaire-20 – SRQ-20) and construct validity (exploratory factor analysis using the method of Promax rotation, based on the slope graph and Kaiser criterion and confirmatory using the structural equation model). Reliability was measured using Cronbach's α coefficient and the test retested in a maximum period of 30 days. Reproducibility was calculated by intraclass correlation.

Results: Three-hundred-forty-one professionals participated, with an average age of 38.6 ± 9.2 years, and 87 participated in a retest survey 30 days later. Exploratory factor analysis showed adequacy of the structure ($KMO = 0.786$) composed of three factors. In the confirmation, the performance was close to acceptable. Reliability was good for the maladaptive strategies ($\alpha = 0.834$) and adequate for the problem-focused strategies ($\alpha = 0.717$), but slightly too low for adaptive strategies ($\alpha = 0.595$). Test-retest showed lower than expected values, with a Spearman-Brown coefficient of 0.703.

Conclusions: The RCS-HCP scale showed satisfactory performance in relation to the properties evaluated.

Introduction

During decision-making in clinical practice, health professionals are constantly challenged to make choices that successfully promote the improvement of the patient's health status(1,2). An error can cause repercussions such as guilt, shame, states of anxiety, patient fear, loss of confidence, inability to verbalize, and repentance(3). In addition, emotional distress at the non-development of coping mechanisms can significantly compromise the mental health of these professionals(4,5).

The strategies that can be used to deal with feelings of repentance can be either problem-centered or emotion-focused(6). Problem-centered strategies are targeted directly to the patient, while emotion-focused strategies are directed to modify the emotional response to the situation, accepting its own limitations or limitations related to care(7,8). Coping strategies have positive and/or negative results when related to work participation. Coping strategies, such as active problem solving, can increase the chance of participation in work, while passive coping and coping with evasion could decrease the chance of participation(9).

In this sense, the evaluation and monitoring of coping strategies in health professionals is extremely important. For this, there are already several tools used internationally. However, in Brazil, there is a scarcity of validated instruments that assess coping situations in the general context and in a feasible way(10,11). In this context, the Regret Coping Scale for Healthcare Professionals (RCS-HCP) scale addresses the strategy of coping with regret related to care by health professionals. This instrument was validated in French (original version), German, and Danish, with applications in physicians, nurses, and social educators. It has a practical and fast approach since its structure includes 15 items and presented a good performance in relation to internal consistency(7,12,13).

Thus, the present study aims to validate the Regret Coping Scale for Healthcare Professionals in Portuguese for its application in Brazilian health professionals.

Methods

Study design and context

This is a cross-sectional study recruited from health-care professionals working with pediatric and adult populations in public, private, and philanthropic hospital institutions in the states of Espírito Santo, Ceará, Pernambuco, Alagoas, Piauí, Bahia, Acre, Minas Gerais, Rio de Janeiro, São Paulo, and the Rio Grande do Sul from October 2018 to April 2019.

Participants

Health professionals participated in the study (physicians, nurses, and physiotherapists), working in direct care to patients and who have at least 6-months experience in the service. The inclusion criterion of the sample was those signing the free and informed consent form for participation in the research by sending the invitation or in person. The professionals answered the questionnaires to collect the sociodemographic variables and later to the other instruments of this research.

DATA MEASUREMENTS

Sociodemographic variables

Sociodemographic variables were obtained through structured interviews and included age (years), sex (male or female), and professional designations (title, number of works, work experience time, typical work shift, and state of origin).

Regret Coping Scale for Healthcare Professionals (RCS-HCP)

The daily strategies for coping with repentance related to the care used by health professionals were measured using the RCS-HCP scale. The scale consists of 15 items that measure strategies for coping with regret that can be focused on the problem or adaptive or maladaptive emotions. The questions assess the change in patient care practices, usually performed after events of regret. Answer options

range from 1 (never or almost never) to 4 (always or almost always). The original scale features three domains. The first domain focused on the problem, and the other focused on adaptive emotion and maladaptive emotion(12). Although the best strategy is situation-specific, and no single strategy can be described as generally better than others, some strategies in domains focused on maladaptive emotion are more associated with negative results(14). The estimate of the latent trait 'dealing with regret' is obtained through the Average Score; the total score of the instrument is not calculated since it is believed that there are three types of coping strategies and not a global strategy.

Self-Reporting Questionnaire – SRQ-20

The SRQ-20 scale was validated in Brazil(15,16) and assessed the prevalence of Common Mental Disorders (depressive, anxious, and somatic complaints). This instrument has 20 questions, and the final score can range from zero (null probability) to 20 (high probability) of common mental disorders(15,16).

Life Satisfaction Scale

The Life Satisfaction Scale comprises five items answered using a 7-point Likert scale, with 1 = totally disagree, 2 = disagree, 3 = disagree slightly, 4 = neither agree nor disagree, 5 = agree slightly, 6 = agree, and 7 = totally agree(17)(18). The total score can range from 5 points (extremely dissatisfied) to 35 points (extremely satisfied)(18).

Instrument Validation

The validation process was composed of two phases, and the methodology adopted for the translation of the scale followed international standards(19,20).

Translation

Translation of the RIS-10 encompassed the following steps: (i) translation by two German-Brazilian Portuguese translators; (ii) harmonization between both Portuguese versions, resulting in a single version in Portuguese; (iii) back-translation of the harmonized version by two Brazilian Portuguese-German translators; (iv) harmonization between both translators, resulting in a single German version; and (v) general harmonization, where the versions resulting from the first and second harmonization were discussed by the four translators to obtain a consensus version(20).

We also translated the RIS-10 from French into Portuguese by two translators and harmonized these translations to assess the differences between the translated versions of German and French. Given that no differences were found between these translations, we adopted the German-to-Portuguese translation as the official translation.

Evaluation of psychometric properties.

Phase II comprised the evaluation of the psychometric properties of validity (content, construct, and criterion) and reliability through field testing.

Content validation

After the scale was translated, the process of cultural adaptation began. For this, this version of the scale was evaluated in relation to content by judges with clinical experience in the studied latent trait. Six judges who have been working in the health care area for more than 5 years participated from each of the following areas: two physicians, two nurses, one psychologist, and one physiotherapist.

First, the evaluation was done qualitatively to obtain the possible suggestions for a better cultural adaptation of the translated terms. The level of agreement among the judges regarding the relevance and representativeness of the items was evaluated by the Content Validity Index (CVI). A 4-point Likert scale was used, where: 1 = not relevant; 2 = item needs a large revision to be representative (not relevant); 3 = quite clear, but needs a small review (very relevant); and 4 = quite clear and representative (highly relevant)(19).

This index is calculated by the sum of the 3- and 4-point answers divided by the total number of judges, yielding a proportion of judges who deemed the item valid. However, 1- and 2-point answers required revision or elimination. To calculate the general CVI of the instrument, the sum of all CVI calculated separately was performed, divided by the number of items(19). A CVI exceeding 0.78 is considered an acceptable agreement rate when six judges participate, which was the case in our study(19,21). The scale's content was evaluated through a pilot study of ten professionals, six nurses, three physicians, and one physiotherapist.

Construct validity

Construct validity testing was performed with exploratory and confirmatory factor analysis. Exploratory factor analysis was performed with the Promax rotation method and used the Kaiser measure to assess the adequacy of the sample to a latent factorial structure. The evaluation of the adequacy of a latent factorial structure to the data was measured using the Kaiser-Meyer-Olkin (KMO) test(22). KMO values exceeding 0.5 were considered adequate (22).

Confirmatory factor analysis (CFA) verified the factorial structure suggested in the original scale with three factors using the structural equation model(12). The adjustment and quality of the sample of this study to the factorial structure were examined using the following: χ^2 (chi-square model), the goodness of fit index (GFI), root mean square error of approximation (RMSEA), standardized root mean squared residual (SRMR), normed fit index (NFI), comparative fit index (CFI), Tucker-Lewis index (TLI), and Bollen's incremental fit index (IFI). The cut-off points considered acceptable for scale adjustment were: $\chi^2: p > 0.05$, GFI > 0.90 ; RMSEA < 0.08 , SRMSR < 0.10 , NFI ≥ 0.90 , CFI > 0.90 , TLI > 0.95 , and IFI > 0.90 (23–26).

Criterion validity

For criterion validity, the total score of the RCS-HCP scale was correlated with the questionnaires validated in Brazil, namely, the SRQ-20 (15,16) and the Life Satisfaction Scale(17). We hoped that some emotion-centered strategies would be more often associated with negative outcomes, such as a higher prevalence of the common mental disorder, and secondly, that problem-centered, emotion-centered strategies would be associated with greater satisfaction with life. Correlations were evaluated using Spearman's rho (ρ), and values of $r \geq 0.3$ were considered acceptable(27).

Reliability

The reliability measures of internal consistency, floor and ceiling effects, test-retest, and Spearman-Brown coefficient were used(27). Cronbach's α was used for internal consistency (28). The floor and ceiling effects were evaluated by determining the lowest and highest percentage of the population in the application of the scale(29,30). The Spearman-Brown coefficient(27) was analyzed by the split method, as detailed in the following strategies. First, the items were randomly divided into two equal halves. A scale mean was computed for each half, and then the two sets of scale means were correlated to estimate a split-half correlation. The split-half correlation was adjusted by the Spearman-Brown formula to create a split-half reliability(31,32). Test-retest reliability was analyzed using the intraclass correlation and Bland-Altman plots (33). Data collection for test-retest analysis was performed within a maximum period of 30 days.

Interpretations of the reliability test items were as follows: Cronbach's α was ≥ 0.7 , as recommended³³, the criterion considered to floor and ceiling effect was $> 20\%$ (29,34), the intraclass correlation (CIC) was considered acceptable when ≥ 0.7 (35) and the Spearman-Brown coefficient was > 0.3 (27). The data were analyzed using the statistical software SAS v.9.4 and the Lavann package v.0.6-5 of R. This study uses a p of 0.05 as the statistical threshold of significance.

Sample size

Calculation of the sample size was based on the psychometric properties evaluated and aimed for a ratio of 15:1 (15 respondents for 1 item of the instrument)(36). Since the scale contains a total of 15 items, 150 participants would be needed. A total of 341 professionals participated in this study.

Ethical aspects

This study was approved by the ethics committee of the Pontifícia Universidade Católica do Rio Grande do Sul – PUC/RS (CAAE: 2.462.827/2018). All participants signed an informed consent form prior to the study.

Results

Sample characteristics

Of the 500 total questionnaires distributed, 341 were completed (68%). Of the 159 questionnaires that were not returned, 119 (75%) were from the online version of the questionnaire, and 40 (25%) of the printed version.

The average age of the participants was 38.6 ± 9.2 years. Most of the sample was female, 217 (64%) and 190 married (56%). Of the participants, 164 (48%) were nursing professionals, with only one job 186 (56%) and 135 (41%) worked the night shift. The interviewees are predominantly from the state of Espírito Santo (76%; Table 1). The overall average coping score was 2.3 ± 0.39 .

Table 1. Characteristics of the Brazilian sample.	
Variables n=341	
Age (years), mean (SD)	38.6 (9.2)
Sex	
Male, n (%)	124 (36)
Female, n (%)	217 (64)
Marital status	
Single, n (%)	151 (44)
Married, n (%)	190 (56)
Professional	
Doctor, n (%)	126 (37)
Nurse, n (%)	164 (48)
Physical therapist, n (%)	51 (15)
Amount of employment	
One employment n (%)	186 (56)
Works at night shift	135 (41)
State of origin	
Espírito Santo. n (%)	260 (76)
Rio Grande do Sul. n (%)	38 (11)
Other. n (%) *	43 (13)

IR25-75: Interquartile range

*Participants from other states: Ceará, Pernambuco, Alagoas, Piauí, Bahia, Acre, Minas Gerais, Rio de Janeiro, and São Paulo.

Instrument translation and cultural adaptation

The items were consistent in both the translation and back-translation processes. Any terms that translated differently between translators were discussed and resolved to ensure uniformity of the instrument.

Content validity

The level of agreement among the judges regarding the relevance and representativeness of the items evaluated by the CVI was 1.00.

Construct validity

Exploratory factor analysis showed the adequacy and detection of the structure with the KMO index = 0.78 considered adequate according to the parameters established in the study. The analysis allowed the extraction of three factors (the first being responsible for 57.3% of the total variation), confirmed in the application of the slope graph (Figure 1).

The correlations of each item to each factor are described in Table 2, according to the suggested factorial structure. The suggested structure of the instrument in the analysis presents the items with distribution in three factors reproducing the version of the original instrument (a measurement of strategies focused on the problem, adaptive and maladaptive) but with alteration in the relationship of the composition of the item to the factor. In factor 1, there was the displacement of an item (Q11) on the scale, increasing the composition of the items that constitute it.

Table 2. Exploratory factor analysis with ProMax rotation factor loading for RCS-HCP.

Scale items	Factor I FED	Factor II FP	Factor III FEA
Q.8. I think so much about it that it consumes me	0.794	- 0.007	- 0.024
Q.12. I have to think all the time in this situation	0.738	0.081	- 0.134
Q.7. I can't stop thinking about these situations	0.731	0.081	- 0.042
Q.9. I tend to blame myself	0.631	-0.043	- 0.042
Q.6. I feel incapable	0.565	0.003	0.074
Q.11. I try to distance myself	0.476	- 0.161	0.412
Q.13. I expose the situation to my colleagues, to improve our way of working	0.037	0.664	0.049
Q.4. I talk to the team to prevent situations like these from repeating	-0.079	0.655	-0.058
Q.1. I talk to colleagues so someone can hear me or give me strength	0.134	0.549	0.058
Q.3. I strive to find concrete solutions to the situations	- 0.085	0.523	0.018
Q.2. I discuss the problem again with patient and/or with his family	0.069	0.492	0.030
Q.15. I try not to give so much value to the situation	- 0.083	- 0.110	0.529
Q.5. I try to accept the situation	- 0.026	0.022	0.520
Q.10. I tell myself that making mistakes is human	0.094	0.106	0.491
Q.14. I struggle to see things on the bright side	- 0.141	0.233	0.451

FP: Focused on the Problem; FEA: Focused Adaptive Emotions; FED: Focused Adaptive Emotions

The CFA results were analyzed to verify the theoretical factorial structure: $\chi^2 = p < 0,001$, RMSEA = 0.075 (IC 90% 0.064–0.086), SRMR = 0.084, GFI = 0.910, NFI = 0.8153, CFI = 0.870, TLI = 0.843, IFI = 0.872. Observing the RMSEA, SRMR, and GFI adjustment indexes, the theoretical factorial structure presents performance close to the acceptable in the sample of this study. However, according to the other measures used for adjustment NFI, CFI, TLI, and IFI this performance is somewhat below acceptable.

Concurrent validity

Participants who presented a maladaptive coping strategy had a positive correlation with the SRQ-20 questionnaire ($\rho = 0.441$; $p < 0.001$) and a negative correlation with the life satisfaction scale ($\rho = -0.192$; $p < 0.001$). The domain of the RCS-HCP instrument focused on the problem was correlated with the life satisfaction scale ($\rho = 0.151$; $p < 0.005$) according to Table 3.

Table 3. Correlation of RCS-HCP scale scores with SRQ-20 and life satisfaction.

Variables	RCS-HCP						
	Average (DP)	Focused on the problem		Unadaptive		Adaptive	
		ρ	p	ρ	P	ρ	p
SRQ-20	5.3 (4.1)	0.037	0.500	0.441	<0.001*	-0.042	0.443
Life satisfaction scale	24.7 (6.3)	0.151	0.005	-0.192	0.000	0.056	0.307

SRQ-20: Self Reporting Questionnaire

Reliability

Cronbach's alpha coefficients for the dimensions: focused on the 0.71 problem and maladaptive 0.83 were adequate and close to those presented in validation studies of the instrument in other countries, for adaptive dimension the result was slightly below 0.59. The value of the alpha coefficient increased to 0.69 if the items "I try to accept the situation" and "I try not to value the situation so much" were excluded from the questionnaire (Table 4).

Table 4. Results of the internal consistency of the instrument RCS-HCP.

Scale domain	French α - cronbach	German α cronbach	Danish α - cronbach	Brazil α - cronbach
Focused on the problem	0.89	0.69	0.69	0.71
Adaptive Strategies	0.89	0.67	0.65	0.59
Unadaptive strategies	0.89	0.86	0.84	0.83
Total	0.85	0.88	-	0.67

In the evaluation of the floor-ceiling effect, eight items presented values higher than 20% for the floor effect observed in the items: 2, 6, 7, 8, 9, 11, 12, and 15, most of which refer to the strategy focused on the problem. The ceiling effect addressed five items: 1.3, 4, 5, 13, and 14, with a higher concentration in the maladaptive strategy (Table 5).

Table 5. Floor and ceiling effect of the RCS-HCP scale.

Scale Items	Floor N (%)	Ceiling N (%)	Average (DP)
1. I talk to colleagues so someone can hear me or give me strength	42 (12.0)	86 (25.0)	64 (31.1)
2. I discuss the problem again with patient and/or with his family	98 (29.0)	51 (15.0)	74.5 (33.23)
3. I strive to find concrete solutions to the situations	6 (2.0)	221 (65.0)	113.5 (152)
4. I talk to the team to prevent situations like these from repeating	14 (4.0)	195 (57.0)	104.5(127.98)
5. I try to accept the situation	62 (19.0)	71 (21.0)	66.5 (6.36)
6. I feel incapable	140 (41.0)	10 (3.0)	75 (91.92)
7. I can't stop thinking about these situations	109 (32.0)	18 (5.0)	63.5 (64.34)
8. I think so much about it that it consumes me	185(55.0)	20 (6.0)	102.5(116.67)
9. I tend to blame myself	137 (40.0)	22 (6.5)	79.5 (81.31)
10. I tell myself that making mistakes is human	64 (19.0)	45 (13.0)	54.5 (13.43)
11. I try to distance myself	148 (43.0)	19 (6.0)	83.5 (91.21)
12. I have to think all the time in this situation	146 (43.0)	18 (5.0)	82 (90.5)
13. I expose the situation to my colleagues. to improve our way of working	33 (10.0)	93 (27.0)	63 (42.42)
14. I struggle to see things on the bright side	17 (5)	99 (29.0)	58 (57.98)
15. I try not to give so much value to the situation	134 (39.0)	15 (4.0)	74.5 (84.14)

For the analysis of the retest test, 87 professionals were attended. The intraclass correlation was 0.60 (95%CI: 0.42–0.72) and for the dimensions: focused on the problem 0.64 (95%CI: 0.45–0.76), focused on disadaptive emotions 0.64 (95%CI: 0.50–0.75) and adaptive 0.50 (95%CI: 0.32–0.64). The Spearman-Brown coefficient ranged from 0.60 to 0.70 (standard deviation equal to 0.04).

Figure 2 shows the Bland-Altman graph of agreement with the mean difference and the limits according to 95% of the Test and Retest. The mean bias was -0.53 with lower and upper limits from -9.50 to 8.44, respectively.

Discussion

In the present study, the German version of the Regret Coping Scale for Healthcare Professionals (RCS-HCP), translated and adapted for the Portuguese, presented an adequate performance and was a valid and reliable measure. The clarity and familiarity of the translated items might have contributed to this performance of the questionnaire in the Brazilian population.

The factorial composition of the repentance scale indicated dimensions, analogous to the results observed in the studies that performed translation and validation of the RCS-HCP(7,12,13). Most items remained in the factors as in the original study. The item that the analysis suggested a different domain was item 11, "I try to distance myself", being conditioned to the Domain focused on the disadaptive emotion. This result underlines the theory that coping strategies can occur differently in each individual; each would present their own style(37), which might influence the use of each one are personal characteristics, reflecting on the psychological balance about their experiences (12,38) or the rationale for preparing professional practice(39). The interaction of previous individual and contextual characteristics affects emotional reactions through stressful events and can present themselves in positive or negative ways in the short and long term(40).

The scale of coping with repentance presented in relation to the maladaptive domain an association with the mental health of professionals evidencing a higher prevalence of common mental disorders according to the original studies in French(12), German(7), and Danish(13) and was significantly related to lower life satisfaction(12). The set of coping strategies can help in the satisfaction and quality of life of the professional, ensuring their capacity in the realization of care(41). Considering the disadaptive coping – a strategy related to emotion – might infer that these professionals have difficulty in regulating them. This result was observed in another study (13), where the authors describe an association of mental health problems with a worse coping or coping with maladaptive regret. The emotion-focused coping strategy refers to the management of emotional response through defensive behaviors to protect censorship(8). Thus, the greater use of the coping strategy with a focus on emotion can be seen as a negative aspect.

The use of problem-focused strategies was positively correlated with life satisfaction, according to studies using the French (12) and German(7) versions. The identification of factors that negatively affect mental health can help the development of effective interventions(42) for a better way of managing emotional response and the establishment of the possibility of the therapeutic model(43), the recognition of coping strategies, in this perspective, can help the promotion of professionals' health and reduce illness(44).

Counseling and discussion can be important functions in coping focused on the problem and emotions, allowing for the analysis of the situation, structuring strategies, and constructive processing of negative feelings(45).

Regarding the adaptive response, resilience is highlighted as an aid within institutions to learn from mistakes and have flexibility and professionals as a way to deal with daily stress as well as adaptation to changes(46). Conceptually, resilience is correlated with coping, and both are stress-conditioned. The divergence occurs once that coping is directed to a strategy used to deal with the situation regardless of the result obtained, and resilience is concerned with successful adaptation(47). Resilience is associated with positive coping strategies (dealing with the problem, optimism), improving the well-being of health professionals (48) and would be a protective factor against the development of mental disorder (49).

Regarding reliability, Cronbach's overall alpha presented the scale with a value lower than the versions already validated (7,12,13) and when compared to other instruments that measure repentance strategies validated in Brazil(11,37,44), but it is discussed that the acceptability of the Cronbach's alpha coefficient is not determined by its statistical significance, which could be considered acceptable coefficients >0.6 (50). The consistency for dimensions (domains) of the scale proved to be adequate as in the original German and Danish versions (7,12,13), being the lowest value in relation to the adaptive domain. Higher reliability coefficients in the scales of immediate and long-term emotional reaction support the conclusion that these aspects are more similar among professionals(40).

In this study, there was a divergence in relation to the verification of the floor and ceiling effect in the German study(7), since a percentage of responses with higher prevalence in responses with the lowest levels of measurement was evidenced. Uniformity of the distribution of responses was observed, even as evidenced by the ground effect, which could infer that this factor was influenced not by a random response pattern, but through a reality presented in the study population. The presence of ceiling and floor effects can influence sensitivity and responsiveness(51) based on the longitudinal distribution of the sample(52).

The results of the RCS-HCP test and retest analyses were below the expected. This might have occurred due to the difference in the time interval of the application of the questionnaires between the professionals, the performance of the questionnaire during the workday or other sources of error. In the literature, there is still no consensus on the ideal time between the applications of the questionnaires(53,54), but it is recommended to be neither overly short nor long, so that it has not memorized the responses or interference of personal and environmental factors(54,55).

A limitation of this study is that the sample was random, but there were participants from several regions of the country, which contributed to the validation process of this instrument due to the greater scope. The sample presented higher representativeness in the states of Espírito Santo and Porto Alegre, respectively. However, the study included participants from different regions of Brazil (Southeast, Northeast, and South) who represent 83% of the population index(56). The self-report methodology used

in this questionnaire-based study might be subject to bias since the reassessment is related to emotional regulation strategies; some strategies should be analyzed at the time of their occurrence. However, it makes it feasible to evaluate repentance in several scenarios because it does not measure specific events, but rather measures the overall experience of regrets, and can be used to evaluate strategies for coping with repentance to different events.

Another important consideration is related to the participation of professionals working only in the hospital environment, which can be declared as another limitation, considering that the generalization for professionals in other environments in direct care also needs to be clarified, and perhaps the target of future studies. Additional studies could evaluate the coping of repentance and the presence/insertion of programs within health services that can assist these professionals in recognizing and implementing coping strategies.

Conclusion

The translated version for the Portuguese of the Regret Coping Scale for Healthcare Professionals (RCS-HCP) presented an adequate performance in its psychometric properties.

Abbreviations

RCS-HCP: Regret Coping Scale for Healthcare Professionals

SWLS: Satisfaction With Life Scale

SRQ-20: Self-Reporting Questionnaire-20

CVI: Content Validity Index

KMO: Kaiser-Meyer-Olkin

CFA: Confirmatory factor analysis

χ^2 : chi-square model

GFI: goodness of fit index

RMSEA: root mean square error of approximation.

SMRS: standardized root mean squared residual.

NFI: normed fit index

CFI: comparative fit index

TLI: Tucker-Lewis index

IFI: Bollen's incremental fit index

Declarations

Ethics approval and consent to participate

This study was approved by the ethics committee of the Pontifícia Universidade Católica do Rio Grande do Sul – PUC/RS (CAAE: 2.462.827/2018). All participants signed an informed consent form prior to the study.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Authors' contributions

Conception, design, analysis and interpretation of data: F. R.N. S; S.M.J.C; R.M; D.S.C

Writing of the article and relevant critical review of the intellectual content: F. R.N. S; S.M.J.C; V.R.S; R.M

Final approval of the version to be published: R.M; D.S.C

All of the authors have substantially contributed to the conception, analysis, interpretation of the data, and/or critical revisions for the intellectual content, and declare that they have approved the manuscript submission.

Acknowledgements

We would like to thank all the health professionals who participated in this study.

References

1. Matheson C, Robertson HD, Elliott AM, Iversen L, Murchie P. Resilience of primary healthcare professionals working in challenging environments: *Br J Gen Pract*. 2016;(May):507–15.
2. Djulbegovic M, Beckstead J, Elqayam S, Reljic T, Kumar A, Paidas C, et al. Thinking Styles and Regret in Physicians. *J Plos One*. 2015;10:1–13.
3. Laurent A, Aubert L, Chahraoui K, Bioy A, Mariage A, Quenot J-P, et al. Error in Intensive Care: Psychological Repercussions and Defense Mechanisms Among Health Professionals. *Crit Care Med*. 2014;42(11):2370–8.
4. Edrees HH, Paine LA, Feroli ER, Wu AW. Health care workers as second victims of medical errors. *Pol Arch Med Wewn*. 2011;121(4):101–8.
5. Wu AW. Medical error: The second victim. *Br Med J*. 2000;320(7237):726–7.
6. Folkman S, Lazarus RS. An analysis of Coping in a middle-aged Community Sample. *J Health Soc Behav*. 1980;21(3):219–39.
7. Richner SC, Cullati S, Cheval B, Schmidt RE, Chopard P, Meier CA, et al. Validation of the German version of two scales (RIS, RCS-HCP) for measuring regret associated with providing healthcare. *Health Qual Life Outcomes*. 2017;15(1):1–11.
8. Chan ST, Khong PCB, Wang W. Psychological responses, coping and supporting needs of healthcare professionals as second victims. *Int Nurs Rev*. 2017;64(2):242–62.
9. de Wit M, Wind H, Hulshof CTJ, Frings-Dresen MHW. Person-related factors associated with work participation in employees with health problems: a systematic review. *Int Arch Occup Environ Health* [Internet]. 2018;91(5):497–512. Available from: <http://dx.doi.org/10.1007/s00420-018-1308-5>
10. Savoia MG, Amadera RD. A Utilização da Versão Brasileira do Inventário de Estratégias de Coping em Pesquisas da Área da Saúde. *Psicol Hosp*. 2016;14(1):117–38.
11. Savoia MG, Reinhardt SP, Mejias NP. Adaptacao do inventario de Estrategias de Coping de Folkman e Lazarus para o Portugues. *Psicol USP USP*. 1996;7(1/2):183–201.
12. Courvoisier DS, Cullati S, Ouchi R, Schmidt RE, Haller G, Chopard P, et al. Validation of a 15-item Care-related Regret Coping Scale for Health-care Professionals (RCS-HCP). *J Occup Health* [Internet]. 2014;56(6):430–43. Available from: https://www.jstage.jst.go.jp/article/joh/56/6/56_14-0060-OA/_article
13. Pihl-Thingvad J, Jacobsen CW, Brandt LPA, Andersen LL, Elklit A, Courvoisier D. The Regret Coping Scale for Health-Care Professionals (RCS-HCP): A validation study with Danish social educators. *Work*. 2018;60(3):401–10.
14. Thompson RJ, Mata J, Jaeggi SM, Buschkuhl M. Maladaptive Coping, Adaptive Coping, and Depressive Symptoms. *Behav Res Ther*. 2010;48(6):459–66.
15. de Jesus Mari J, Williams P. A validity study of a psychiatric screening questionnaire (SRQ-20) in primary care in the city of Sao Paulo. *Br J Psychiatry*. 1986;148(1):23–6.
16. Iacoponi E, de Jesus Mari J. Reliability and factor structure of the Portuguese version of Self-Reporting Questionnaire. *Int J Soc Psychiatry*. 1989;35(3):213–22.

17. Zanon C, Bardagi MP, Layous K, Hutz CS. Validation of the Satisfaction with Life Scale to Brazilians: Evidences of Measurement Noninvariance Across Brazil and US. *Soc Indic Res.* 2014;119(1):443–53.
18. Diener E, Emmons RA, Larsen RJ, Griffin S. The Satisfaction With Life Scale. *J Pers Assess.* 1985;49(1):71–5.
19. Polit DF, Beck CT, Owen S V. Is the CVI an Acceptable Indicator of Content Validity? Appraisal and Recommendations. *Res Nurs Health.* 2007;30:459–67.
20. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures. *Spine.* 2000;25(24):3186–91.
21. Polit DF, Beck CT. The Content Validity Index: Are You Sure You Know What's Being Reported? Critique and Recommendations. *Res Nurs Health.* 2006;31(4):341–54.
22. Jolliffe I. Principal components analysis. *International Encyclopedia of Education.* Springer, New York; 2002. 374–377 p.
23. Cheung GW, Rensvold RB. Evaluating Goodness-of-fit Indexes for Testing Measurement Invariance. 2002;9(2):233–55.
24. Cangur S, Ercan I. Comparison of model fit indices used in structural equation modeling under multivariate normality. *J Mod Appl Stat Methods.* 2015;14(1):152–67.
25. Chen FF. Sensitivity of goodness of fit indexes to lack of measurement invariance. *Struct Equ Model.* 2007;14(3):464–504.
26. Bollen KA. Sample Size and Bentler and Bonnets Nonnormal Fit Index. *Psychom Soc.* 1986;51(3):375–7.
27. Li H, Rosenthal R, Rubin DB. Reliability of Measurement in Psychology: From Spearman-Brown to Maximal Reliability. *Psychol Methods.* 1996;1(1):98–107.
28. Taber KS. The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *Res Sci Educ.* 2018;48(6):1273–96.
29. McHorney CA, Ware JE, Rachel Lu JF, Sherbourne CD. The MOS 36-Item Short-Form Health Survey (SF-36): III. Tests of Data Quality, Scaling Assumptions, and Reliability Across Diverse Patient Groups. *Med Care [Internet].* 1994 Jan;32(1):40–66. Available from: <https://insights.ovid.com/crossref?an=00005650-199401000-00004>
30. Benett S., Oldridge N, Eckert G., Embree J., Browning S, Hou N, et al. Discriminant properties of commonly used quality of life measures in heart failure. *Qual Life Res.* 2002;11:349–59.
31. Kuder GF, Richardson MW. The theory of the estimation of test reliability. *Psychometrika.* 1937;2(3):151–60.
32. Groppe DM, Makeig S, Kutas M. Identifying reliable independent components via Split-half comparisons. *Neuroimage.* 2009;45(4):1199–211.
33. Bland MJ, Altman DG. Statistical methods for assessing agreement between two methods of clinical measurement. *Lancet.* 1986;62(7):307–10.

34. Youngstedt SD. Ceiling and floor effects in sleep research. *Sleep Med Rev* [Internet]. 2003 Aug;7(4):351–65. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1087079201902394>
35. Middel B, Bouma J, de Jongste M, van Sonderen E, Niemeijer MG, van den Heuvel W. Psychometric properties of the Minnesota living with heart failure questionnaire (MLHF-Q). *Clin Rehabil*. 2001;15(5):489–500.
36. Mueller RO. Structural equation modeling: Back to basics. *Struct Equ Model A Multidiscip J*. 1997;4(4):353–69.
37. Chamon EMQDO. Estresse e estratégias de enfrentamento: o uso da escala Toulousaine no Brasil. *Rev Psicol Organ e Trab* [Internet]. 2006;6(2):43–64. Available from: <https://periodicos.ufsc.br/index.php/rpot/article/view/1108>
38. Shapiro J, Astin J, Shapiro SL, Robitshek D, Shapiro DH. Coping with loss of control in the practice of medicine. *Fam Syst Heal J Collab Fam Healthc*. 2011;29(1091–7527):15–28.
39. Groopman J, Hartzband P. The Power of Regret. *N Engl J Med*. 2017;377(16):1507–9.
40. Larsson G, Nilsson S, Hyllengren P, Ohlsson A, Waaler G, Kallenberg K. Stress reactions following acute situations involving moral challenges among health care professionals. *Scand J Psychol*. 2018;59(2):177–85.
41. Mohammadi M, Peyrovi H, Mahmoodi M. The Relationship between Professional Quality of Life and Caring Ability in Critical Care Nurses. *Dimens Crit Care Nurs*. 2017;36(5):273–7.
42. Schmidt RE, Cullati S, Mostofsky E, Haller G, Agoritsas T, Mittleman MA, et al. Healthcare-related regret among nurses and physicians is associated with self-rated insomnia severity: A cross-sectional study. *PLoS One*. 2015;10(10):1–12.
43. Connolly T, Reb J. Regret in cancer-related decisions. *Heal Psychol*. 2005;24(4 SUPPL.).
44. Andrade Paiva Morero J, Rodrigues Bragagnollo G, Signorini Santos MT. Estratégias de enfrentamento: uma revisão sistemática sobre instrumentos de avaliação no contexto brasileiro. *Rev Cuid*. 2018;9(2):2257–68.
45. Karga M, Kiekkas P, Aretha D, Lemonidou C. Changes in nursing practice: Associations with responses to and coping with errors. *J Clin Nurs*. 2011;20(21–22):3246–55.
46. Demo G, Oliveira Á de F, Costa AC. Resiliência no trabalho: Revisão bibliométrica sistemática no contexto brasileiro e itinerários da produção nacional. *Rev Psicol Organ e Trab*. 2017;17(3):180–9.
47. Taboada NG, Legal EJ, Machado N. Resiliência: em busca de um conceito. *J Hum Growth Dev*. 2006;16(3):104.
48. McGarry S, Girdler S, McDonald A, Valentine J, Lee SL, Blair E, et al. Paediatric health-care professionals: Relationships between psychological distress, resilience and coping skills. *J Paediatr Child Health*. 2013;49(9):725–32.
49. Shrivastava A, Desousa A. Resilience: A psychobiological construct for psychiatric disorders. *Indian J Psychiatry*. 2016;58(1):38–43.

50. Loewenthal KM, Eysenck MW. An introduction to Psychological test and scales. 2nd ed. NEW YORK: Taylor and Francis; 2001.
51. Terweel C., Dekker F., Wiersinga W., Prummed M., Bossuyt PM. On assessing responsiveness of hearth-related quality of life instruments: guidelines for instrument evaluation. Qual Life Res. 2003;12:349–62.
52. Eurich DT, Johnson JA, Reid KJ, Spertus JA. Assessing responsiveness of generic and specific health related quality of life measures in heart failure. Health Qual Life Outcomes. 2006;4:1–14.
53. Tsang S, Royse CF, Terkawi A. Guidelines for developing, translating, and validating a questionnaire in perioperative and pain medicine. Saudi J Anesth. 2017;11(5):80–9.
54. Streiner DL, Kottner J. Recommendations for reporting the results of studies of instrument and scale development and testing. J Adv Nurs. 2014;70(9):1970–9.
55. Pasquali L. Psicometria: Teoria dos Testes na psicologia e na educação. 6ª Reimpre. Petrópolis, Rio de Janeiro: Vozes; 2013. 398 p.
56. IBGE - Instituto Brasileiro de Geografia e Estatística. Estimativas populacionais para os municípios e para as Unidades da Federação brasileiros em 01.07.2020. 2020.

Figures

Figure 1

Figure 2

Bland-Altman graph of regret intensity (RCS-HCP) for baseline and 1-month follow-up surveys.