Liberabit, 2025, 31(1), e1047 (enero - junio) https://doi.org/10.24265/liberabit.2025.v31n1.1047
ISSN (Digital): 2223-7666

Factor Structure Analysis of Perceived Stress Scale Among Healthcare Students

Análisis de la estructura factorial de la escala de estrés percibido en estudiantes de Ciencias de la Salud

Giordanne Guimarães Freitas[a], Marcos Pascoal Pattussi[b], Tonantzin Ribeiro Gonçalves[c, *]

[a] Universidade de Rio Verde - UniRV, Faculdade de Medicina, Rio Verde, GO, Brasil
[b] Universidade do Vale do Rio dos Sinos - Unisinos,
Programa de Pós-graduação em Saúde Coletiva, São Leopoldo, RS, Brasil
[c] Universidade Federal de Ciências da Saúde de Porto Alegre - UFCSPA,
Programa de Pós-graduação em Psicologia e Saúde, Porto Alegre, RS, Brasil

Recibido: 8 de enero de 2025 Aceptado: 21 de abril de 2025

Abstract

Background: Although the Perceived Stress Scale (PSS-10) is widely used, rigorous assessment of its internal structure among healthcare students remains necessary. **Objective**: To evaluate the psychometric properties of the PSS in healthcare university students. **Method**: Two random samples totaling 399 healthcare students completed the PSS-10. Exploratory factor analysis used WLSMV estimator with oblique rotation. Confirmatory factor analysis employed Structural Equation Modeling with covariance matrix. Orthogonal bifactor analysis tested PSS-10 dimensionality. Analyses were conducted for both total sample and gender-stratified subgroups. Multi-group confirmatory factor analysis assessed gender equivalence of factor structure. **Results**: Scale items showed satisfactory factor loadings (> .40), good internal consistency (α > .80) and reliability (ω > .84), and acceptable discriminant validity between factors (< .85). Correlations between PSS-10 factors and psychological distress and resilience were of expected magnitude and direction. Confirmatory factor analysis indicated better adjustment parameters (RMSEA = .091; CFI = .977; SRMR = .032) for the two-factor solution (negative perception and stress coping) for both the total sample and sex. **Conclusions**: The two-factor model showed no measurement invariance across gender groups. Orthogonal bifactor models supported PSS-10 unidimensionality. Despite statistical nuances across factor models, the PSS-10 provides a robust, simple, unidimensional measure of perceived stress among healthcare students.

Keywords: Stress, University Students, Test Validity, Psychometrics.

Resumen

Antecedentes: aunque la Escala de Estrés Percibido (PSS-10) es ampliamente utilizada, sigue siendo necesaria una evaluación rigurosa de su estructura interna entre estudiantes de ciencias de la salud. **Objetivo**: evaluar las propiedades psicométricas de la PSS en estudiantes universitarios de ciencias de la salud. **Método**: dos muestras aleatorias que totalizaron 399 estudiantes de ciencias de la salud completaron la PSS-10. El análisis factorial exploratorio utilizó el estimador WLSMV con rotación oblicua. El análisis factorial confirmatorio empleó el Modelado de Ecuaciones Estructurales con matriz de covarianza. El análisis bifactorial ortogonal evaluó la dimensionalidad de la PSS-10. Los análisis se realizaron tanto para la muestra total como para subgrupos estratificados por género. El análisis factorial confirmatorio multigrupo evaluó la equivalencia de la estructura factorial entre géneros. **Resultados**: los ítems de la escala mostraron cargas factoriales satisfactorias (> .40), buena consistencia interna (α > .80) y fiabilidad (ω > .84), y validez discriminante aceptable entre factores (< .85). Las correlaciones entre los factores de la PSS-10 y el malestar psicológico y la resiliencia fueron de la magnitud y dirección esperadas. El análisis factorial confirmatorio indicó mejores parámetros de ajuste (RMSEA = .091; CFI = .977; SRMR = .032) para la solución de dos factores (percepción negativa y afrontamiento del estrés) tanto para la muestra total como por sexo. **Conclusiones**: el modelo de dos factores no mostró invarianza de medición entre grupos de género. Los modelos bifactoriales ortogonales respaldaron la unidimensionalidad de la PSS-10. A pesar de los matices estadísticos entre los modelos factoriales, la PSS-10 proporciona una medida robusta, simple y unidimensional del estrés percibido entre estudiantes de ciencias de la salud.

Palabras clave: estrés, estudiantes universitarios, validación de test, psicometría.

Para citar este artículo:

Guimarães, G., Pascoal, M., & Ribeiro, T. (2025). Factor Structure Analysis of Perceived Stress Scale Among Healthcare Students. *Liberabit, 31*(1), e1047. https://doi.org/10.24265/liberabit.2025.v31n1.1047

* tonantzin@ufcspa.edu.br

While experiencing some level of stress in daily life is normal, functioning as an adaptive mechanism essential for individual engagement, chronic stress has been linked in the literature to the development of various physical and psychological health issues (Cohen et al., 2019; Turner et al., 2020). Therefore, assessing healthy populations to identify factors associated with increased risk of chronic stress is crucial (Karyotaki et al., 2020). Several studies have examined the prevalence of subjective stress among university students, both internationally (Gbessemehlan et al., 2020; Hoteit et al., 2024) and in Brazil (Demenech et al., 2021; Pacheco et al., 2017).

A substantial portion of the studies employ the Perceived Stress Scale (PSS) (Cohen et al., 1983), a measure aligned with the transactional model of stress (Lazarus & Folkman, 1984). Initially, the PSS was developed with 14 items; later, reduced versions with 10 and four items were created (Cohen & Williamson, 1988). The 10-item version of the PSS assesses cognitive aspects of stress perception, such as distress, predictability, and controllability in the face of situations experienced in the past month (Cohen & Williamson, 1988). This scale has already shown validity evidence in several countries such as the United States (Taylor, 2015), Ecuador (Ruisoto et al., 2020), Iran (Maroufizadeh et al., 2018), Germany (Schneider et al., 2017), and China (Huang et al., 2020).

In a systematic review of 19 PSS validation studies, it was found that aspects such as internal consistency and factorial validity are well reported, while test-retest reliability and criterion validity are rarely assessed (Lee, 2012). Originally, the PSS-10 is presented as a unidimensional instrument (Cohen & Williamson, 1988). However, this finding is not universally agreed upon, as some studies have found the unidimensional structure to be more appropriate (Machado et al., 2014; Mitchell et al., 2008; Santos-Vitti et al., 2024), while others have identified the two-factor model as more suitable for the instrument (Lesage et al., 2012; Schneider et al., 2017).

A recent systematic review of the factor structure of the PSS examined 57 studies with 76 distinct samples, totaling over 46,000 participants who completed the PSS-10 and 28,000 who completed the PSS-14 (Kogar & Kogar, 2024). The authors conducted a Meta-Analytic Confirmatory Factor Analysis (MACFA), which revealed that the correlated two-factor model best explained the factor structure of the PSS, considering findings related to dimensionality, factor loadings, omega values, and measurement invariance. Thus, further research may contribute to the understanding of the dimensionality of the PSS-10 in different cultures.

In Brazil, the scale was initially adapted and validated by Luft et al. (2007) based on a sample of older adults, identifying good internal consistency (α = .83) and a unidimensional structure. Three other studies evaluated the psychometric properties of the PSS-10 among professors (Machado et al., 2014; Reis et al., 2010; Soares et al., 2018). Reis et al. (2010) conducted an exploratory factor analysis based on a sample of university professors and found two factors composed of six negative items and four positive items, as well as satisfactory internal consistency (α = .87). Machado et al. (2014) assessed the dimensionality of the PSS-10 and identified the unidimensional model as the most appropriate for the scale, using parallel analysis as the retention criterion. They found factor loadings greater than 0.4 for all items and adequate internal consistency (α = .80). Soares et al. (2018) found good internal consistency (α = .87) and better fitting indices for the two-factor solution among 222 university professors in the 14-item and 10-item versions of the PSS.

Another four Brazilian studies have assessed the PSS-10 among female university students, the general population, and pregnant women. Dias et al. (2015) compared one-factor models of the PSS-14, PSS-10, and PSS-4 among female university students and identified the PSS-10 as having the most favorable fit parameters, with excellent internal consistency (α = .83) and evidence of divergent validity (Dias et

al., 2015). A population-based study analyzed the dimensionality of the instrument, comparing the different 14, 10, and 4-item versions (Faro, 2015). The results indicated a satisfactory fit for the two-factor model, and the 10-item scale was found to be harmonious between the full and reduced versions, considering the number of items and the statistical robustness of the instrument. A study with 2,847 pregnant women evaluated using the 14- and 10-item versions of the PSS (Yokokura et al., 2017) also found a better fit for the two-factor models, with high internal consistency ($\alpha \geq .70$). The study provided evidence of convergent and discriminant validity for the PSS through correlations with a psychological violence scale, recommending that perceived stress among pregnant women be assessed using the two-factor model (Yokokura et al., 2017). Finally, a recent study with an online convenience sample of 4,970 adults supported the one-factor structure of the PSS-10 (Santos-Vitti et al., 2024). It demonstrated good performance across all items, with some showing differential functioning between men and women (Santos-Vitti et al., 2024).

No studies evaluating the internal structure of the PSS-10 that included both male and female university students were found, underscoring the need to assess the instrument's performance in this population from a sex-based perspective. Thus, this study aimed to gather evidence of the internal structure of the 10-item Perceived Stress Scale (PSS-10) among health science university students, considering men and women separately.

Method

Research design

This is a cross-sectional, university-based study, employing systematic random sampling.

Participants

Participants were medical students from a university in the Midwest region of Brazil, aged over 18 years. Using a census sample, these students were part of a larger project that assessed health conditions and associated factors among 2,295 health science students in 2018. For the present study, two distinct random samples of 399 medical students (200 women and 199 men in each sample) were selected for exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), respectively.

Instruments

The participants completed a comprehensive structured, pre-tested, self-administered questionnaire, which included items from the Perceived Stress Scale (PSS-10). The questionnaire also included other validated instruments and questions for determining the participants' health status and for sociodemographic characterization (age, sex, race, marital status, economic class, among others). Economic status was determined using the classification system adopted by the Brazilian government and developed by the *Associação Brasileira de Empresas de Pesquisa* (ABEP, Brazilian Association of Research Companies) (http://www.abep.org), with participants distributed among strata A, B, and C/D. None of the students fell into class E. Following the official Brazilian Census methodology, self-declared skin color (white, black, pardo [brown], yellow, or indigenous) was used as a proxy for population-based racial classification.

The PSS-10 was developed by Cohen et al. (1983) and adapted for the Brazilian context (Luft et al., 2007; Reis et al., 2010). The original scale comprises 10 items (four positive and six negative), each rated on a five-point Likert scale from 0 (never) to 4 (very often). Positive items 4, 5, 7, and 8 are reverse scored to compute the final score. The total scale score is calculated by summing the scores of all 10 items (Cohen & Williamson, 1988), with possible scores ranging from 0 to 40.

The Kessler Psychological Distress Scale (K10) and the Brief Resilience Scale (BRS) were used to obtain evidence of convergent and discriminant validity of the PSS-10, respectively. Both scales were

translated by bilingual researchers, using back-translation procedures. In the present study, the scales showed excellent levels of internal consistency (K10: α = .929; BRS: α = .823).

The K10 is a 10-item scale that assesses the frequency of nonspecific psychological symptoms over the past month (Kessler et al., 2002). Responses are rated on a five-point Likert scale (1 = *None of the time* to 5 = *All of the time*), with scores ranging from 10 to 50 points, where higher scores indicate greater psychological distress. The Brief Resilience Scale (BRS) consists of six items that measure resilience (Smith et al., 2008) (e.g., «I tend to bounce back quickly after hard times»; «It is hard for me to snap back when something bad happens»), with responses rated on a five-point Likert scale (1 = *strongly disagree*; 5 = *strongly agree*).

Procedures

Data collection was carried out in person by a trained research team in November 2018. Students who participated in the study were approached in the classroom and received the research questionnaire along with two copies of the Informed Consent Form (ICF). The instruments were read aloud by the lead researcher to facilitate responses, reduce doubts, and minimize missing data on the studied variables. Those who agreed to participate signed two copies of the ICF, keeping one copy for themselves. After completion, the anonymous questionnaires were placed in a sealed ballot box. Students who were absent on the day of data collection were contacted up to two times to participate in the study.

Data Analysis

Initially, data were double-entered into the EpiData version 3.1 program and subsequently reviewed to eliminate typing errors. Then, in the STATA 15.0 program, sociodemographic and economic variables were analyzed using descriptive statistics, including means, standard deviations, and relative and absolute frequencies. In the second phase, Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were conducted using Mplus software, considering both the total random samples (399 in each) and by sex (200 women and 199 men in each).

To test the assumptions of the EFA, the WLSMV (Weighted Least Squares Mean and Variance Adjusted) with the PROBIT link was used, along with Geomin oblique rotation, which allows factors to be related. The CFA was performed using Structural Equation Modeling, considering the covariance matrix. Additionally, an orthogonal bifactor analysis was conducted to examine the dimensionality of the PSS-10, both in the total sample and in gender-stratified subgroups. This model assumes the existence of a general factor that directly influences all items on the scale (i.e., global perceived stress), along with specific factors that account for the shared residual variance among subsets of items (Reise et al., 2013).

To assess model fit for the EFA, CFA, and bifactor analyses, the following indices were considered: the chi-square to degrees of freedom ratio (χ^2/df), the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). χ^2/df values typically indicate a good model fit between 2 and 3, CFI values close to or greater than .90, RMSEA values close to or below .08, and SRMR values close to or below .06 (Bandalos & Gerstner, 2016; Hu & Bentler, 1999).

To evaluate the unidimensionality of the scale using the bifactor model, in addition to these fit indices, the following statistical indicators were calculated: the Explained Common Variance (ECV), which reflects the proportion of common variance accounted for by the general factor; the Percent of Uncontaminated Correlations (PUC), which indicates the percentage of item correlations influenced solely by the general factor; and Omega Hierarchical (ωH), which estimates the proportion of variance in total scores attributable to the general factor (Reise et al., 2013; Rodriguez et al., 2016).

The internal consistency and reliability of the PSS-10 were measured by Cronbach's α and the omega (ω) coefficient, which represents the proportion of total variance that can be attributed to the true score (DeVellis, 2017). Values equal to or greater than 0.6 for both measures were considered acceptable (DeVellis, 2017). Discriminant validity was assessed through the Multitrait-Multimethod (MTMM) framework, which examines the extent to which the scale measures distinct constructs. Within this framework, we calculated the Average Variance Extracted (AVE) for each factor. We applied two complementary criteria: 1) Fornell and Larcker's (1981) criterion, which posits that discriminant validity is established when a factor's AVE exceeds the squared correlations between that factor and other factors in the model, and 2) Kline's (2015) guideline that factor correlations should remain below .85 to indicate adequate distinction between constructs. This dual-criterion approach strengthened our evaluation of the PSS-10's capacity to discriminate between conceptually related dimensions of perceived stress.

Multi-group confirmatory factor analysis (MG-CFA) assessed the equivalence of factor structure across biological sex. The analysis followed three steps: (1) Configural invariance, verifying the structure's plausibility across groups; (2) Metric invariance, testing factor loading equivalence; and (3) Scalar invariance, examining variance and covariance equivalence. Given the sensitivity of χ^2 and $\Delta\chi^2$ to large samples, factorial invariance was determined using ΔCFI (≤ .01) and ΔRMSEA (< .015) relative to the less restrictive model (Pendergast et al., 2017). To assess the convergent and discriminant validity of the two-factor structure of the PSS-10, Spearman correlation analyses were conducted between the subscales of the PSS-10, the Kessler Psychological Distress Scale (K10) and the Brief Resilience Scale (BRS).

Results

The demographic and socioeconomic characteristics of the two samples of 399 students are presented in Table 1. The majority were between 20 and 21 years of age and had white skin color. Most students had no fixed partner and belonged to economic classes A and B (Table 1).

Internal Consistency and Reliability

The one-factor solution showed a Cronbach's alpha (α) of about .88 (in the entire sample) and an omega (ω) of .91, indicating strong internal consistency and reliability. In the two-factor solution, both α and ω remain high (≥ .80) across the total sample and in the sex-stratified groups (Table 2).

Convergent and Discriminant Validity

All Average Variance Extracted (AVE) values exceeded .50, indicating adequate precision in capturing the underlying construct across the different models, thus supporting convergent validity. Moreover, factor correlations in both the total sample and within each sex indicate that negative perception of stress was strongly associated with higher psychological distress (K10) and moderately associated with lower resilience (BRS), suggesting acceptable discriminant validity (Supplemental Table).

Table 1
Sociodemographic characteristics of the medical students

Variables	EFA (*n* = 399)		CFA (*n* = 399)	
	Men	Women	Men	Women
	N (%)	N (%)	N (%)	N (%)
Age range (in years)				
18 to 19	44 (22)	31 (15.5)	28 (14)	27 (13.5)
20 to 21	62 (31)	65 (32.5)	63 (51.5)	69 (34.5)
22 to 23	54 (27)	57 (28.5)	61 (30.5)	64 (32)
24 or more	40 (20)	47 (23.5)	48 (24)	40 (20)
Skin color				
White	124 (62)	124 (62)	129 (64.5)	115 (57.5)
Black or Mixed Race	72 (36)	75 (35)	63 (31.5)	81 (40.5)
Others	4 (2)	6 (3)	8 (4)	4 (2)
Marital status				
With partner	22 (11)	22 (11)	19 (9.55)	18 (9)
Without partner	178 (89)	177 (89)	180 (90.45)	182 (91)
Economic class				
Class A	121 (63.02)	90 (46.15)	116 (59.49)	102 (52.04)
Class B	59 (30.73)	91 (46.67)	65 (33.33)	79 (40.31)
Class C/D	12 (6.5)	14 (7.18)	14 (7.18)	15 (7.65)

Exploratory Factor Analysis

The one-factor solution showed unfavorable fit indices (RMSEA = .154; CFI = .931; TLI = .911; SRMR = .070), indicating a suboptimal model fit. In contrast, the two-factor solution demonstrates a significant improvement (RMSEA = .128; CFI = .964; TLI = .946; SRMR = .050), suggesting a considerably better fit than the one-factor model. Both men and women exhibit the same pattern, with the two-factor model providing a superior fit. Overall, the RMSEA and CFI/TLI indices follow similar trends, primarily supporting the two-factor structure (Table 2).

Table 2

EFA and internal consistency of the 10-item PSS-10 among medical students (N = 399)

	Total sample (*n* = 399)			Men (*n* = 199)			Women (*n* = 200)		
	1 factor[a]	2 factors[b]		1 factor[c]	2 factors[d]		1 factor[e]	2 factors[f]	
In the last month, how often have you...	1	1	2	1	1	2	1	1	2
1) ... been upset because of something that happened unexpectedly?	.717	**.765**	-.028	.664	**.610**	.075	.738	**.908**	-.140
2) ... felt that you were unable to control the important things in your life?	.827	**.719**	.152	.782	**.697**	.118	.865	**.725**	.201
3) ... felt nervous and «stressed»?	.764	**.904**	-.127	.773	**.949**	-.185	.718	**.742**	.012
4) ... felt confident about your ability to handle your personal problems?	.674	.149	**.595**	.681	.046	**.732**	.629	.244	**.449**
5) ... felt that things were going your way?	.748	-.015	**.848**	.738	-.005	**.850**	.770	.041	**.818**
6) ... found that you could not cope with all the things that you had to do?	.573	**.589**	.011	.553	**.562**	.007	.556	**.622**	-.030
7) ... been able to control irritations in your life?	.679	**.540**	.182	.699	**.646**	.080	.638	**.405**	.295
8) ... felt that you were on top of things?	.795	.084	**.798**	.778	.244	**.615**	.794	-.008	**.915**
9) ... been angered because of things that were outside of your control?	.664	**.679**	.012	.665	**.835**	-.179	.623	**.511**	.162
10)...felt difficulties were piling up so high that you could not overcome them?	.801	**.634**	.220	.825	**.807**	.046	.783	**.557**	.297
Internal consistency (α)	.88	.85	.80	.87	.84	.81	.87	.84	.78
ω Coefficient	.91	.87	.84	.91	.86	.84	.91	.86	.84
AVE	.53	.55	.64	.52	.54	.64	.52	.53	.64
Adjustment									
χ^2(df)	364.13* (35)	195.14* (26)		197.18*(35)	121.11* (26)		196.78*(35)	100.330* (26)	
RMSEA (CI)	.154	.128		.153	.136		.152	.120	
	(.139 - .168)	(.111 - .145)		(.132 - .174)	(.112 - .160)		(.132 - .173)	(.095 - .145)	
CFI	.931	.964		.935	.962		.919	.963	
TLI	.911	.938		.916	.934		.895	.935	
SRMR	.070	.046		.078	.055		.078	.05	
F1-F2 Correlation		.81			.80			.80	

Notes: Values in bold: $p < .05$; *Item allocation in factors according to higher factor loading. One factor = F1 - Perceived stress. Two factors = F1 – Negative Perception; F2 – Coping. Indices = (α): *Cronbach's* Alpha Coefficient; (ω): Omega Coefficient; AVE (Average Variance Extracted); χ^2: (*Chi-square*); RMSEA (*Root Mean Square Error of Approximation*); CFI (*Comparative Fit Index*); TLI (Tucker Lewis-Index), SRMR (*Standardized Root Mean Square Residual*); F1-F2 Correlation (*Geomin Factor Correlation*).

Confirmatory Factor Analysis

Table 3 presents the fit indices and multigroup confirmatory factor analysis (MG-CFA) results for three models: one factor, two factors, and orthogonal bifactor. It also includes the ECV, Hierarchical ω and PUC metrics for the bifactor model.

Table 3

CFA and MG-CFA for the one-factor, two-factor, and orthogonal bifactor models for the PSS-10 according to biological sex (N = 399)

Models	χ^2 (df)	CFI	ΔCFI	TLI	SRMR	RMSEA (90% CI)	ΔRMSEA
One Factor							
Total sample	357.755 (35)	.934		.915	.053	.152 (.138 - .167)	
Female	211.696 (35)	.921		.898	.058	.159 (.139 - .180)	
Male	254.025 (35)	.916		.892	.059	.177 (.157 - .198)	
Configural	499.190 (100)	.910	-	.919	.061	.141 (.129 - .154)	-
Metric	363.173 (108)	.942	-.032	.952	.057	.109 (.097 - .121)	-.032
Scalar	363.173 (108)	.942	.000	.952	.057	.109 (.097 - .121)	.000
Two Factors							
Total sample	146.291 (34)	.977		.970	.032	.091 (.076 - .106)	
Female	112.783 (34)	.965		.953	.042	.108 (.086 - .130)	
Male	120.350 (34)	.967		.956	.038	.113 (.091 - .135)	
Configural	416.858 (98)	.993	-	.991	.052	.128 (.115 - .140)	-
Metric	371.977 (108)	.940	-.053	.950	.052	.111 (.099 - .123)	-.017
Scalar	229.584 (106)	.972	.032	.976	.047	.076 (.063 - .090)	-.035
Bifactor							
Total sample	166.678 (28)	.971		.953	.034	.111 (.095 - .128)	
Female	77.693 (28)	.975		.960	.037	.094 (.070 - .119)	
Male	72.103 (28)	.982		.971	.034	.089 (.064 - .115)	

	ECV	wH	PUC
Total sample	.795	.936	.467
Female	.719	.768	.467
Male	.793	.845	.467

Notes: χ^2 = chi-square; df = degrees of freedom; CFI = Comparative Fit Index; ΔCFI = Delta relative to the CFI of the Configural model; TLI = Tucker Lewis Index; SRMR = Standardized Root Mean Square Residual; RMSEA = Root Mean Square Error of Approximation; ΔRMSEA = Delta relative to the RMSEA of the Configural model; Configural = fixed factor structure across groups; Metric = fixed factor structure and factor loadings across groups; Scalar = fixed factor structure, factor loadings, thresholds, and scalars across groups; ECV (*Explained Common Variance*); ωH (*Hierarchical Omega*). *n* Women = 200; *n* Men = 199.

The CFA results confirmed the EFA patterns, with the two correlated first-order factors consistently providing the best-fit indices across both the overall and sex-stratified samples (Table 3). However, the results for the orthogonal bifactor models also provided acceptable evidence supporting the unidimensionality of the PSS-10. The ECV values were all above .60 (Reise et al., 2013), with estimates of .79 for the total sample, .79 for males, and .71 for females. Similarly, the ω*H* coefficients exceeded .70 across the total sample and gender-specific subgroups (Reise et al., 2013), indicating that a substantial proportion of the reliable variance in total scores is attributable to the general factor. Additionally, item

factor loadings were consistently higher on the general factor than on the specific factors, further supporting the dominance of a single latent dimension. The PUC parameter was relatively low (≤ .47), suggesting that a considerable number of item correlations are influenced by specific factors. Taken together, these indices suggest that the PSS-10 can also be considered unidimensional in this population (Reise et al., 2013; Rodriguez et al., 2016). Factorial loadings for one-factor, two-factor, and bifactor models are available as Supplementary Material.

Invariance Testing

The results of the MG-CFA, presented in Table 3, provided limited support for measurement invariance across gender groups. For both the one-factor and two-correlated-factors models, most changes in the Comparative Fit Index (ΔCFI) and Root Mean Square Error of Approximation (ΔRMSEA) exceeded the recommended thresholds for invariance (Pendergast et al., 2017). Only the transition from metric to scalar invariance in the one-factor model approached acceptable criteria. These findings suggest the presence of potential differential item functioning in the PSS-10 across gender groups.

Discussion

This study aimed to investigate the construct validity and dimensionality of the PSS-10 among young university students, with a specific focus on examining potential differences by sex. The instrument's internal consistency and reliability showed adequate results, above .7 (Hair et al., 2009). These findings are in line with those observed in other studies in international (Lee, 2012; Kogar & Kogar, 2024) and national contexts (Faro, 2015; Soares et al., 2018; Yokokura et al., 2017). Likewise, the average variance extracted (AVE) did not violate the recommended cut-off points in the literature, and the factor loadings were all above .50, apart from two, which supports evidence of the precision of the PSS-10 in measuring the latent trait (Valentini & Damásio, 2016). The correlations between the PSS-10 factors were high but still below the recommended threshold (< .85), suggesting that while the factors form the evaluation of a higher-order latent variable, they measure specific characteristics.

Considering the PSS-10 dimensionality, the two-factor correlated model demonstrated the most appropriate fit parameters for both the overall sample and when analyzed separately by gender. At the same time, the bifactor analysis results offered psychometric evidence supporting the scale's unidimensional structure among Brazilian university students. These nuanced findings contribute to the ongoing scholarly debate surrounding the PSS-10's dimensionality.

The original authors of the PSS-10 considered the two-factor structure inadequate both theoretically and statistically (Cohen & Williamson, 1988). They argued that the division into two factors merely reflected the response structure of the scale items, which include both positive and negative statements (Cohen & Williamson, 1988). However, this argument has been criticized, and several subsequent studies have confirmed a two-correlated-factor structure in international (Anwer et al., 2020; Khalili et al., 2017; Lee, 2012; Messineo & Tosto, 2024; Nielsen et al., 2016; Tsegaye et al., 2022; Kogar & Kogar, 2024) and national contexts (Faro, 2015; Luft et al., 2007; Reis et al., 2010; Yokokura et al., 2017). In a recent study, Anwer et al. (2020) assessed the factorial structure among Saudi health science university students showing that the two-factor model of the PSS had better fitting parameters. Faro (2015) and Yokokura et al. (2017) also indicated a better statistical fit for the bidimensional model among the general population and pregnant women, respectively.

In contrast to our findings, another Brazilian study involving university professors supported the existence of only one factor, although the results showed some low factor loadings (Machado et al., 2014). In this study, all items were highly loaded onto the designated factors. It is worth noting that the fit indices were similar between men and women, suggesting the existence of a latent pattern corroborated across the different

samples of the study. Such findings were also observed in the study by Nielsen et al. (2016).

The two-factor structure results from assessing two distinct facets of stress. The first facet encompasses the negative effects caused by stress on perception and refers to the state of wear and/or suffering experienced by individuals in such situations (Lazarus & Folkman, 1984). The second facet, a positive factor, relates to the perception of one's ability to cope with stressors (Lazarus & Folkman, 1984). In the present study, Factor 1, related to the negative perception of stress, was composed of items 1, 2, 3, 6, 7, 9, and 10, while Factor 2, related to stress coping, comprised items 4, 5, and 8 of the PSS-10. This factor structure differs from that found in other studies where item 7 («How often have you been able to control irritations in your life?») had a better factor loading on Factor 2 (Kogar & Kogar, 2024; Messineo & Tosto, 2024; Reis et al., 2010; Schneider et al., 2017; Yokokura et al., 2017). This highlights the need for further studies to examine the behavior of PSS-10 items in different populations, considering sociodemographic characteristics.

Previous researchers argued that bifactor analysis could offer more comprehensive and robust insights into the PSS-10's internal structure compared to traditional one- and two-factor analytical approaches (Reise et al., 2013; Rodriguez et al., 2016). Our bifactor analysis findings support the primacy of a global perceived stress construct, revealing minimal substantive multidimensionality within the PSS-10 instrument. These results align with recent studies that have comparatively examined one-factor, two-factor, and bifactor models (Juárez-Garcia et al., 2023; Lee & Jeong, 2019; Pretorius, 2023; Santos-Vitti et al., 2024). However, it is important to note that our results did not indicate the bifactor model as the optimal fit for the data when considering RMSEA parameters.

Such seemingly contradictory findings are not uncommon in psychological scales measuring closely related constructs. In practical terms, our results suggest that although a strict two-factor model may demonstrate superior statistical performance, the bifactor analysis reveals a single dominant dimension underlying most of the items' variance. Nevertheless, it is important to be mindful of the intended use of the scale. If the two factors correspond to conceptually distinct subdomains that are theoretically meaningful and have different correlates or outcomes, scoring these subdimensions separately might still be warranted. On the other hand, if one simply needs a global measure of the perceived stress among college students (and the subfactors do not provide unique explanatory power), the bifactor model's evidence of a strong general factor supports treating the scale as essentially unidimensional for most applied purposes.

Contradicting previous findings with students and the general adult population (Juárez-Garcia et al., 2023; Lee, 2022; Messineo & Tosto, 2024; Santos-Vitti et al., 2024), we found evidence indicating significant variations in model parameters between male and female samples. It suggests potential differential item functioning in the PSS-10, implying that some items may be interpreted or responded to differently by male and female participants. Future studies should further investigate PSS-10 equivalence either across gender groups or among people with distinct age, educational and social class groups.

The present study also gathered evidence of convergent and discriminant validity for the two factors of the PSS-10, with strong or moderate correlations in both samples of men and women. The results indicated that scores on Factor 1 of the PSS-10, which reflect the negative emotional perception of stress, converged with the scores on the psychological distress scale and diverged from the scores on the resilience scale. Conversely, scores on Factor 2, reflecting the positive perception of controllability and coping with stress, converged with the scores obtained on the resilience scale and diverged from those on the psychological distress scale. The study by Dias et al. (2015) found evidence of discriminant validity for the total PSS-10 scores among female university students, comparing them with burnout and weight concern measures. Yokokura et al. (2017) found high

correlations, in the expected direction, between the scores on the two factors of the PSS-10 and a psychological violence scale among pregnant women. To the authors' knowledge, this is the first Brazilian study to provide evidence of convergent and discriminant validity for the two-factor solution of the PSS-10 by sex.

It is important to report some limitations of the present research. It was not possible to conduct test-retest and sensitivity analyses of the instrument due to the complexity of performing repeated assessments and diagnostic clinical interviews with a large sample. Additionally, the chi-square (χ^2) values were all high and significant ($p < .001$) in the different analyses performed, although with lower values in the two-factor models. This may suggest a poor fit of the models, as the estimated and observed data matrices differ considerably, indicating caution in interpreting the results. However, the value of this fit index is commonly influenced by large samples, as described by Hair et al. (2009), and thus does not invalidate our findings.

Regarding the RMSEA values observed in both our EFA and CFA analyses, which were all above the conventional cutoff of .08 suggested by Byrne (2012) and Hair et al. (2009), it is worth noting that there is ongoing debate about the appropriateness of strict adherence to cutoff values. As highlighted by Medrano and Muñoz-Navarro (2017), the interpretation of fit indices should be contextualized rather than applied universally. The authors describe what they termed «bad RMSEA» as a situation where researchers rigidly adhere to cutoff values without considering substantive theory, methodological limitations, or other complementary indices that may support model adequacy. In our case, several other indices (CFI, TLI, SRMR) showed acceptable values, suggesting that the model maintains partial validity despite RMSEA limitations. Further, Chen et al. (2008) have demonstrated that RMSEA tends to penalize models with small degrees of freedom and those applied to complex psychological constructs, which may be the case with the Perceived Stress Scale. Following Kenny et al. (2015), who advise against using RMSEA for models with low degrees of freedom, we believe our results should be interpreted holistically across multiple fit indices rather than focusing solely on RMSEA. The consistent pattern of factor loadings across analyses and the coherence with theoretical expectations provide additional support for our proposed structure despite suboptimal RMSEA values. It should also be noted that we observed a decrease in RMSEA values between the EFA and CFA, suggesting potential improvement in model specification. Nevertheless, future research should explore complementary analytic approaches, such as those based on Item Response Theory, which might provide new insights that honor the theoretical complexity of the perceived stress.

Finally, the sample consisted of students, which limits the generalization of the findings to the general population. Future studies should focus on socially and culturally diverse populations to confirm the scale's factor structure and gather evidence of measurement invariance across age, gender, and social class.

Conclusion

The PSS-10 scale is a brief and widely used questionnaire that, based on the results of the present study, demonstrates acceptable psychometric properties and validity for identifying psychological stress, whether considering its overall score. Also, some evidence supports the use of scores for two distinct facets of stress perception. The evidence strengthens the case for a structure composed of one general factor, a model that proved appropriate for both men and women. Ultimately, the choice between a one-score versus a two-score interpretation depends on theoretical rationales, psychometric evidence, and practical considerations (e.g., whether separate subscale scores add meaningful predictive or clinical value). Thus, the PSS-10 is a valid and reliable instrument for measuring stress among university students, demonstrating equivalence across genders.

Conflicting interests

The authors declared no potential conflicts of interest concerning authorship or publication of this article.

Ethical Responsibilities

The research from which this study originated was approved by the Ethics Committees of Unisinos University (approval N.º 2.892.764) and the University of Rio Verde (approval N.º 2.905.704), adhering to the criteria established by Resolution 466/2012 of the National Health Council for research involving human subjects in Brazil. All participants signed the Informed Consent Form, and the study was anonymized.

Authorship contributions

GGF: Conceptualization, Formal Analysis, Investigation, Writing - Original Draft.

MPP: Methodology, Formal Analysis, Investigation, Project Administration, Data Curation, Writing - Review and Editing.

TRG: Conceptualization, Formal Analysis, Supervision, Writing - Review and Editing.

References

Anwer, S., Manzar, M. D., Alghadir, A. H., Salahuddin, M., & Hameed, U. A. (2020). Psychometric Analysis of the Perceived Stress Scale among Healthy University Students. *Neuropsychiatric Disease and Treatment*, *16*, 2389-2396. https://doi.org/10.2147/NDT.S268582

Bandalos, D. L., & Gerstner, J. J. (2016). Using factor analysis in test construction. In K. Schweizer & C. DiStefano (eds.), *Principles and Methods of Test Construction: Standards and Recent Advances* (pp. 26-51). Hogrefe Publishing.

Byrne, B. (2012). *Structural Equation Modeling with Mplus: Basic Concepts, Applications, and Programming*. Routledge.

Chen, F., Curran, P. J., Bollen, K. A., Kirby, J., & Paxton, P. (2008). An Empirical Evaluation of the Use of Fixed Cutoff Points in RMSEA Test Statistic in Structural Equation Models. *Sociological Methods & Research*, *36*(4), 462-494. https://doi.org/10.1177/0049124108314720

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A Global Measure of Perceived Stress. *Journal of Health and Social Behavior*, *24*(4), 385-396. https://doi.org/10.2307/2136404

Cohen, S., & Williamsom, G. M. (1988). Perceived Stress in a Probability Sample of the United States. In S. Spacapan, & S. Oskamp (eds.), *The Social Psychology of Health: Claremont Symposium on Applied Social Psychology* (pp. 31-67). Sage Publications.

Cohen, S., Murphy, M., & Prather, A. A. (2019). Ten Surprising Facts About Stressful Life Events and Disease Risk. *Annual Review of Psychology*, *70*, 577-597. https://doi.org/10.1146/annurev-psych-010418-102857

Demenech, L. M., Oliveira, A. T., Neiva-Silva, L., & Dumith, S. C. (2021). Prevalence of Anxiety, Depression and Suicidal Behaviors among Brazilian Undergraduate Students: A Systematic Review and Meta-Analysis. *Journal of Affective Disorders*, *282*, 147-159. https://doi.org/10.1016/j.jad.2020.12.108

Dias, J. C., Silva, W., Maroco, J., & Campos, J. A. (2015). Escala de estresse percebido aplicada a estudantes universitárias: estudo de validação. *Psychology, Community & Health*, *4*(1), 1-13. https://doi.org/10.5964/pch.v4i1.90

DeVellis, R. F. (2017). Reliability. In *Scale Development Theory and Applications* (4.th ed, pp. 49-85). Sage Publications.

Faro, A. (2015). Confirmatory Factor Analysis of Three Versions of the Perceived Stress Scale (PSS): A Population-Based Study. *Psicologia: Reflexão e Crítica*, *28*(1), 21-30. https://doi.org/10.1590/1678-7153.201528103

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(3), 39-50. https://doi.org/10.1177/002224378101800313

Gbessemehlan, A., Arsandaux, J., Orri, M., Montagni, I., Macalli, M., Tournier, M., Tzourio, C., & Galéra, C. (2020). Perceived Stress Partially Accounts for the Association between Attention Deficit Hyperactivity Disorder (ADHD) Symptoms and Suicidal Ideation

among Students. *Psychiatry Research*, *291*, 113284. https://doi.org/10.1016/j.psychres.2020.113284

Hair, J. F., Black, B., Babin, B., Anderson, R. E., & Tatham, T. L. (2009). *Análise multivariada de dados* (6.th ed.). Artmed Editora.

Hoteit, R., Bou-Hamad, I., Hijazi, S., Ayna, D., Romani, M., & El Morr, C. (2024). A Cross-Sectional Study of University Students' Mental Health and Lifestyle Practices Amidst the COVID-19 Pandemic. *PloS One*, *19*(4), e0302265. https://doi.org/10.1371/journal.pone.0302265

Hu, L. T., & Bentler, P. M. (1999). Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria versus New Alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1-55. https://doi.org/10.1080/10705519909540118

Huang, F., Wang, H., Wang, Z., Zhang, J., Du, W., Su, C., Jia, X., Ouyang, Y., Wang, Y., Li, L., Jiang, H., & Zhang, B. (2020). Psychometric Properties of the Perceived Stress Scale in a Community Sample of Chinese. *BMC Psychiatry*, *20*(1), 1-7. https://doi.org/10.1186/S12888-020-02520-4

Juárez-García, A., Merino-Soto, C., Brito-Ortiz, J. F., Nava-Gómez, M. E., & Monroy-Castillo, A. (2023). Is it the perceived stress scale (PSS) undimimensional and invariant? A bifactor analysis in mexican adults. *Current Psychology*, *42*, 7252-7266. https://doi.org/10.1007/s12144-021-02067-x

Karyotaki, E., Cuijpers, P., Albor, Y., Alonso, J,. Auerbach, R. P., Bantjes, J., Bruffaerts, R., Ebert, D. D., Hasking, P., Kiekens, G., Lee, S., McLafferty, M., Mak, A., Mortier, P., Sampson, N. A., Stein, D. J., Vilagut, G., & Kessler, R. C. (2020). Sources of Stress and Their Associations With Mental Disorders Among College Students: Results of the World Health Organization World Mental Health Surveys International College Student Initiative. *Frontiers Psychology*, *11*, 1759. https://doi.org/10.3389/fpsyg.2020.01759

Kenny, D. A., Kaniskan, B., & McCoach, D. B. (2015). The Performance of RMSEA in Models with Small Degrees of Freedom. *Sociological Methods & Research*, *44*(3), 486-507. https://doi.org/10.1177/0049124114543236

Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S. L., Walters, E. E., & Zaslavsky, A. M. (2002). Short Screening Scales to Monitor Population Prevalences and Trends in Non-Specific Psychological Distress. *Psychological Medicine*, *32*(6), 959-976. https://doi.org/10.1017/S0033291702006074

Khalili, R., Sirati, M., Ebadi, A., Tavallai, A., & Habibi, M. (2017). Validity and Reliability of the Cohen 10-Item Perceived Stress Scale in Patients with Chronic Headache: Persian Version. *Asian Journal of Psychiatry*, *26*, 136-140. https://doi.org/10.1016/j.ajp.2017.01.010

Kline, R. B. (2015). *Principles and Practice of Structural Equation Modeling* (4.th ed.). Guilford Press.

Kogar, E., & Kogar, H. (2024). A Systematic Review and Meta-Analytic Confirmatory Factor Analysis of the Perceived Stress Scale (PSS-10 and PSS-14). *Stress and Health*, *40*(1), e3285. https://doi.org/10.1002/smi.3285

Lazarus, R. S., & Folkman, S. (1984). *Stress, Appraisal, and Coping*. Springer.

Lee, E. H. (2012). Review of the Psychometric Evidence of the Perceived Stress Scale. *Asian Nursing Research*, *6*(4), 121-127. https://doi.org/10.1016/j.anr.2012.08.004

Lee, B., & Jeong, H. I. (2019). Construct Validity of the Perceived Stress Scale (PSS-10) in a Sample of Early Childhood Teacher Candidates. *Psychiatry and Clinical Psychopharmacology*, *29*(1), 76-82. https://doi.org/10.1080/24750573.2019.1565693

Lee, B. (2022). Measurement Invariance of the Perceived Stress Scale-10 Across Gender in Korean University Students. *International Journal of Mental Health*, *52*(1), 70-83. https://doi.org/10.1080/00207411.2022.2046924

Lesage, F. X., Berjot, S., & Deschamps, F. (2012). Psychometric Properties of the French Versions of the Perceived Stress Scale. *International Journal of Occupational Medicine and Environmental Health*, *25*(2), 178-184. https://doi.org/10.2478/S13382-012-0024-8

Luft, C. D., Sanches, S., Mazo, G., & Andrade, A. (2007). Brazilian Version of the Perceived Stress Scale: Translation and Validation for the Elderly. *Revista de Saúde Pública*, *41*(4), 606-615. https://doi.org/10.1590/0034-89102007000400015

Machado, W. D. L., Damásio, B. F., Borsa, J. C., & Silva, J. P. (2014). Dimensionalidade da escala de estresse percebido (perceived stress scale, PSS-10) em uma amostra de professores. *Psicologia: Reflexão e Crítica*, *27*(1), 38-43. https://doi.org/10.1590/S0102-79722014000100005

Maroufizadeh, S., Foroudifard, F., Navid, B., Ezabadi, Z., Sobati, B., & Omani-Samani, R. (2018). The Perceived Stress Scale (PSS-10) in Women Experiencing Infertility: A Reliability and Validity Study. *Middle East Fertility Society Journal*, *23*(4), 456-459. https://doi.org/10.1016/j.mefs.2018.02.003

Medrano, L. A., & Muñoz-Navarro, R. (2017). Conceptual and Practical Approach to Structural Equations Modeling. *Revista Digital de Investigación en Docencia Universitaria*, *11*(1), 219-239. https://doi.org/10.19083/ridu.11.486

Messineo, L., & Tosto, C. (2024). Evaluation of the Psychometric Properties of the Italian Version of the 10-item Perceived Stress Scale in a Sample of Teachers. *Frontiers in Psychology*, *14*, 1330789. https://doi.org/10.3389/fpsyg.2023.1330789

Mitchell, A. M., Crane, P. A., & Kim, Y. (2008). Perceived Stress in Survivors of Suicide: Psychometric Properties of the Perceived Stress Scale. *Research in Nursing and Health*, *31*(6), 576-585. https://doi.org/10.1002/nur.20284

Nielsen, M. G., Ørnbøl, E., Vestergaard, M., Bech, P., Larsen, F. B., Lasgaard, M., & Christensen, K. S. (2016). The Construct Validity of the Perceived Stress Scale. *Journal of Psychosomatic Research*, *84*, 22-30. https://doi.org/10.1016/j.jpsychores.2016.03.009

Pacheco, J. P., Giacomin, H. T., Tam, W. W., Ribeiro, T. B., Arab, C., Bezerra, I. M., & Pinasco, G. C. (2017). Mental Health Problems among Medical Students in Brazil: A Systematic Review and Meta-Analysis. *Revista Brasileira de Psiquiatria*, *39*, 369-378. https://doi.org/10.1590/1516-4446-2017-2223

Pendergast, L. L., Von der Embse, N., Kilgus, S. P., & Eklund, K. R. (2017). Measurement Equivalence: A Non-Technical Primer on Categorical Multi-Group Confirmatory Factor Analysis in School Psychology. *Journal of School Psychology*, *60*, 65-82. https://doi.org/10.1016/j.jsp.2016.11.002

Pretorius, T. B. (2023). The Perceived Stress Scale is Essentially Unidimensional: Complementary Evidence from Ancillary Bifactor Indices and Mokken Analysis. *Acta Psychologica*, *241*, 104058. https://doi.org/10.1016/j.actpsy.2023.104058

Reis, R., Hino, A. A., & Añez, C. R. (2010). Perceived Stress Scale: Reliability and Validity Study in Brazil. *Journal of Health Psychology*, *15*(1), 107-114. https://doi.org/10.1177/1359105309346343

Reise, S. P., Scheines, R., Widaman, K. F., & Haviland, M. G. (2013). Multidimensionality and Structural Coefficient Bias in Structural Equation Modeling: A Bifactor Perspective. *Educational and Psychological Measurement*, *73*(1), 5-26. https://doi.org/10.1177/0013164412449831

Rodriguez, A., Reise, S. P., & Haviland, M. G. (2016). Evaluating Bifactor Models: Calculating and Interpreting Statistical Indices. *Psychological Methods*, *21*(2), 137-150. https://doi.org/10.1037/met0000045

Ruisoto, P., López-Guerra, V. M., Paladines, M. B., Vaca, S. L., & Cacho, R. (2020). Psychometric Properties of the Three Versions of the Perceived Stress Scale in Ecuador. *Physiology and Behavior*, *224*, 113045. https://doi.org/10.1016/j.physbeh.2020.113045

Santos-Vitti, L., Nakano, T., Faro, A., Baptista, M. N., & Vasconcelos, M. M. (2024). Perceived Stress Assessment: Factor Structure and Item Analysis of the PSS-10. *Acta Colombiana de Psicología*, *27*(1), 1, 65-78. https://doi.org/10.14718/acp.2024.27.1.4

Schneider, E. E., Schönfelder, S., Wolf, M., & Wessa, M. (2017). All Stressed Out? Introducing a German Version of the Perceived Stress Scale: Validation, Psychometric Properties and Sample Differences in Healthy and Clinical Populations. *Psychoneuroendocrinology*, *83*, 21. https://doi.org/10.1016/j.psyneuen.2017.07.296

Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The Brief Resilience Scale: Assessing the Ability to Bounce Back. *International Journal of Behavioral Medicine*, *15*(3), 194-200. https://doi.org/10.1080/10705500802222972

Soares, M. B., Mafra, S. C. T., & De Faria, E. R. (2018). Validation of a Scale of Perceived Stress in Higher Education Professors. *Revista Reuna*, *23*(1), 1-19. https://doi.org/10.21714/2179-8834/2018v23n1p1-19

Taylor, J. M. (2015). Psychometric Analysis of the Ten-Item Perceived Stress Scale. *Psychological Assessment*, *27*(1), 90-101. https://doi.org/10.1037/a0038100

Tsegaye, B. S., Andegiorgish, A. K., Amhare, A. F., & Hailu, H. B. (2022). Construct Validity and Reliability Amharic Version of Perceived Stress Scale (PSS-10) among Defense University students. *BMC Psychiatry*, *22*(1), 691. https://doi.org/10.1186/s12888-022-04345-9

Turner, A. I., Smyth, N., Hall, S. J., Torres, S. J., Hussein, M., Jayasinghe, S. U., Ball, K., & Clow, A. J. (2020). Psychological Stress Reactivity and Future Health and Disease Outcomes: A Systematic Review of Prospective Evidence. *Psychoneuroendocrinology*, *114*, 104599. https://doi.org/10.1016/j.psyneuen.2020.104599

Valentini, F., & Damásio, B. F. (2016). Variância Média Extraída e Confiabilidade Composta: Indicadores de Precisão. *Psicologia: Teoria e Pesquisa*, *32*(2), e322225. https://doi.org/10.1590/0102-3772e322225

Yokokura, A. V., Da Silva, A. A., Fernandes, J. D., Del-Ben, C. M., De Figueiredo, F. P., Barbieri, M. A., & Bettiol, H. (2017). Perceived Stress Scale: Confirmatory Factor Analysis of the PSS14 and PSS10 Versions in Two Samples of Pregnant Women from the BRISA Cohort. *Cadernos de Saúde Pública*, *33*(12), e00184615. https://doi.org/10.1590/0102-311x00184615

Giordanne Guimarães Freitas

Universidade de Rio Verde - UniRV, Faculdade de Medicina, Rio Verde, GO, Brasil.

PhD en Medicina. Profesor en la Faculdade de Medicina de la Universidade de Rio Verde (UniRV), Brasil. Sus líneas de investigación se centran en endocrinología, estrés y conductas relacionadas con la salud.

ORCID: https://orcid.org/0000-0001-5970-0800

giordanne@uol.com.br

Marcos Pascoal Pattussi

Universidade do Vale do Rio dos Sinos - Unisinos, Programa de Pós-graduação em Saúde Coletiva, São Leopoldo, RS, Brasil.

PhD en Ciencias de la Salud. Profesor del Programa de Posgrado en Salud Colectiva de la Universidade do Vale do Rio dos Sinos (Unisinos), Brasil. Su interés en la investigación abarca la epidemiología, la salud psicosocial, el capital social y la salud bucal.

ORCID: https://orcid.org/0000-0003-2947-4229

mppattussi@unisinos.br

Tonantzin Ribeiro Gonçalves

Universidade Federal de Ciências da Saúde de Porto Alegre - UFCSPA, Programa de Pós-graduação em Psicologia e Saúde, Porto Alegre, RS, Brasil.

PhD en Psicología. Profesor en el Programa de Posgrado en Psicología y Salud de la Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSPA), Brasil. Su trabajo de investigación se orienta a la salud mental, las relaciones de género y las intervenciones en estos ámbitos.

ORCID: https://orcid.org/0000-0003-0249-3358

Autor corresponsal: tonantzin@ufcspa.edu.br