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Evaluation and Preliminary Validity of the Perceived Stress Scale (PSS-14)

Scarlett Caroca Madariaga[1*], Gabriela Ruiz Valenzuela[1], Valeska Tapia Espinoza[1], Sofía Hidalgo Vilche[2], Nicole Klein Vallecillo[2], & Mariela Bustamante Fernández[6]

[1]*School of Medicine, University of Chile. Santiago, Chile*

[2]*School of Psychology, University of Chile. Santiago, Chile*

[3]*Department of Pediatrics and Pediatric Surgery, Western Region, University of Chile. Santiago, Chile*

[*]Corresponding author: Scarlett Caroca Madariaga, School of Medicine, University of Chile. Santiago, Chile.

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Abstract

Background: *Stress is conceptualized as a set of psychophysiological responses to demanding stimuli, which, when persistent, can result in significant adverse health outcomes. Pediatric healthcare professionals represent a particularly vulnerable group due to occupational stress often associated with suboptimal coping mechanisms, impacting both their well-being and the quality of care provided to patients. Despite a universally accepted instrument for assessing stress within this population, the Perceived Stress Scale (PSS-14) has emerged as a promising measure. However, its inconsistent factorial solutions across studies underscore the necessity of evaluating its psychometric properties within specific local contexts to ensure valid and reliable interpretation. The present study seeks to adapt and preliminarily validate the PSS-14 for pediatric healthcare professionals.*

Methods: *The PSS-14 was reviewed both theoretically and empirically, and a pilot test was conducted in four pediatric emergency departments in Chile with 65 healthcare professionals. Confirmatory factor analyses of the original unidimensional and bifactorial models were performed based on contemporary evidence. Qualitative and quantitative results were contrasted to conclude on the relevance of using the scale for emergency healthcare personnel.*

Results: *The results of the factorial analysis of the unidimensional model showed a poor fit of the data ($\chi^2 = 366.782$, $df = 77$, $p < 0.001$, RMSEA = 0.24, CFI = 0.787, TLI = 0.748, and SRMR = 0.14). The bifactorial model showed promising results ($\chi^2 = 143.212$, $df = 63$, $p < 0.001$; RMSEA = 0.14, CFI = 0.94; TLI = 0.92; SRMR = 0.06). This bifactorial model suggested two underlying dimensions of perceived stress: one of positive coping with stress and another of negative coping. However, five problematic items were identified. Perceptions about time control and each daily event, as well as the behavior of thinking about pending tasks, would not be appropriate in the work of a pediatric emergency department, where uncertainty is part of the daily norm and not considered a problematic source of stress compared to other elements of their daily routine.*

Conclusions: *Preliminary results showed that the bifactorial model, which distinguishes between positive and negative coping with stress, had a better fit than the unidimensional model. However, some items were problematic, such as those related to time control and pending tasks, as they are not relevant in the context of pediatric emergencies, where uncertainty is common. The results suggest that the use of the scale should take into account the contextual characteristics of the work for an adequate stress assessment.*

Keywords: Stress, Pediatric Health Personnel, Pediatric Emergency Department, Factor Analysis, Pss-14

Abbreviations

- **PPS-14:** Perceived Stress Scale

Introduction

Stress is defined as psychophysiological reactions generated by the perception of challenging demands Persistent stress levels that exceed coping abilities may be linked with detrimental health consequences [1, 2]. Stress in the health care work context can be associated with cardiovascular, digestive, and neuropsychiatric disorders and with the use of different maladaptive coping strategies, such as lower job satisfaction, decreased productivity, increased errors, poor patient care and a higher turnover, which are detrimental to healthcare services [3-5]. This impacts not only on a personal level but also on the quality of care, making an early detection and intervention approach relevant [4].

The prevalence of burnout among US physicians was found to be 54%, nearly double that of the general working population [5]. One of the risk groups regarding stress levels is pediatric healthcare workers [6]. Although there is no international consensus on the best instrument to evaluate the stress of pediatric health personnel, a promising scale is the Perceived Stress Scale (PSS-14) proposed by Cohen et al. (1983), it is a self-reported questionnaire that was designed to measure "the degree to which individuals appraise situations in their lives as stressful" [7]. The PSS-14 was developed under the transactional model of stress, to measure the degree to which life experiences are regarded as stressful for an individual, with 14 items evaluating the degree to which individuals believe their life has been unpredictable, uncontrollable, and overloaded during the previous month [8, 9]. The items on the scale are scored on a 5-point Likert scale (0 = never, 4 = very frequently). Items 1, 2, 3, 8, 11, 12 and 14 refer to perceived stress, while items 4, 5, 6, 7, 9, 10 and 13 refer to coping with perceived stress [10]. The two-factor structure of the PSS has been supported by some studies; however, findings regarding this structure have been inconsistent, with some researchers suggesting that the scale may be essentially unidimensional and that additional variability arises from reversed items [11, 12]. The total score of the PSS-14 is calculated by reversing the scores of items 4, 5, 6, 7, 9, 10, and 13 (in the following manner: 0=4, 1=3, 2=2, 3=1, and 4=0) and then summing the 14 items [13]. The direct score indicates that a higher score corresponds to a greater level of perceived stress [10]. Studies have shown that the PSS-14 has satisfactory internal consistency, with alphas ranging from 0.74 to 0.91 [14].

Regarding the internal consistency of the PSS-14, determined by the Cronbach's Alpha coefficient of the scale adapted into Spanish by Dr. Remor and validated in his initial study Spanish Version of the Perceived Stress Scale (PSS-14): Psychometric Study in an HIV+ Sample, Remor E. & Carrobles JA. (2001), it was 0.67 [13]. Although it is one of the most widely used stress assessment scales in the world and has been translated into multiple languages, the scale has been poorly validated and utilized in Latin America, with studies limited to a few countries such as Argentina, Peru, Colombia, and Ecuador [10]. In the case of Chile, a study was found that applied the Spanish-translated scale to teachers in the Atacama region. However, the Spanish version of the scale has not been validated or applied to pediatric healthcare professionals in Chile.

This research aims to conduct a preliminary factor analysis of the PSS-14 for pediatric healthcare professionals in pediatric emergency departments in Chile, to validate the scale in Chile and guide interventions that promote mental and physical health, optimize patient care, and foster a healthier work environment.

Methodology

A cross-sectional study was conducted to evaluate the psychometric properties of the Perceived Stress Scale (PSS-14) in a sample of 65 healthcare professionals working in four Chilean pediatric emergency departments.

The sample included healthcare professionals from four pediatric emergency departments, including physicians, nurses, and allied health staff. All participants were actively engaged in direct patient care in high-pressure environments. Participants were recruited during their shifts in pediatric emergency departments. A research team member explained the study objectives and provided participants with written informed consent forms. Participants completed the scale anonymously and voluntarily, with confidentiality maintained throughout the process. The study protocol received approval from the local ethics committees of each participating hospital.

To explore the factorial structure of the scale, confirmatory factor analyses (CFA) were conducted using two distinct models: a unidimensional model, which posits a single general factor, and a bifactor model, which simultaneously examines a general factor (Stress) and two specific factors: Perceived Stress (PS) and Coping with Stress(CS). The analyses were performed using Mplus (version 8) with the WLSMV (Weighted Least Squares Mean and Variance Adjusted) estimation method, suitable for ordinal data.

Model fit was assessed using key fit indices, including χ^2/df, CFI (Comparative Fit Index), TLI (Tucker-Lewis Index), RMSEA (Root Mean Square Error of Approximation), and SRMR (Standardized Root Mean Square Residual). These indices provided a comprehensive evaluation of model performance and facilitated comparisons between the unidimensional and bifactor models regarding statistical and theoretical adequacy.

Additionally, the internal consistency of the subscales was examined using Cronbach's alpha coefficients to evaluate the reliability of the specific dimensions and the general factor. This approach allowed for the assessment of the structural validity and practical utility of the PSS-14 in the context of healthcare professionals managing high-stress situations in pediatric emergency settings.

Missing data were managed using pairwise deletion, as the missingness rate was below 5% for all items.

Results

This study examined two approaches to modeling the factorial structure of the PSS-14 in pediatric emergency healthcare personnel: a unifactorial model, where all items load onto a single general factor (perceived stress), and a bifactorial model, which includes a general factor alongside two specific factors: positive coping and negative coping).

The results of the factor analysis of the one-dimensional model revealed significant factor loadings (range: 0.205–0.887), however the overall model fit was suboptimal ($\chi^2 = 366.782$, df = 77, $p < 0.001$ RMSEA = 0.24, CFI = 0.787, TLI = 0.748 and SRMR = 0.14). This suggests that a single factor does not sufficiently capture the dynamics of perceived stress in this context (See Table 1).

Table 1: Factor Loading Unifactorial Model

Factor Latente	Item	Factor Loading	Standard Error	Est./S.E.	p-Value
General Stress	PSS_01	0.562	0.061	9.193	<0.001
	PSS_02	0.741	0.044	16.911	<0.001
	PSS_03	0.466	0.078	5.965	<0.001
	PSS_04	-0.647	0.058	-11.123	<0.001
	PSS_05	-0.717	0.053	-13.567	<0.001
	PSS_06	-0.794	0.04	-19.94	<0.001
	PSS_07	-0.887	0.033	-27.204	<0.001
	PSS_08	0.609	0.062	9.778	<0.001
	PSS_09	-0.876	0.035	-24.829	<0.001
	PSS_10	-0.839	0.038	-22.039	<0.001
	PSS_11	0.498	0.063	7.873	<0.001
	PSS_12	0.205	0.102	2.006	0.045
	PSS_13	-0.613	0.067	-9.198	<0.001
	PSS_14	0.723	0.053	13.575	<0.001

Notes: The table displays the standardized factor loadings for the unifactorial model of the Perceived Stress Scale (PSS-14). The latent factor "General Stress" represents the single underlying construct measured by the scale. The factor loadings indicate the strength and direction of the relationship between each item and the latent factor. Negative factor loadings reflect reverse-scored items.

The bifactor model yielded promising results, revealing three meaningful dimensions of perceived stress: Perceived Stress, Coping with Stress, and a General Stress Factor (See Figure 1). The internal consistency of the factors identified in the bifactorial model was assessed using Cronbach's alpha. The Perceived Stress factor exhibited excellent internal consistency, with a Cronbach's alpha of 0.894, indicating strong reliability in measuring this construct. Similarly, the Coping with Stress factor displayed good internal consistency, with a Cronbach's alpha of 0.820. These values suggest that the items within each factor are consistent and effectively measure their respective constructs.

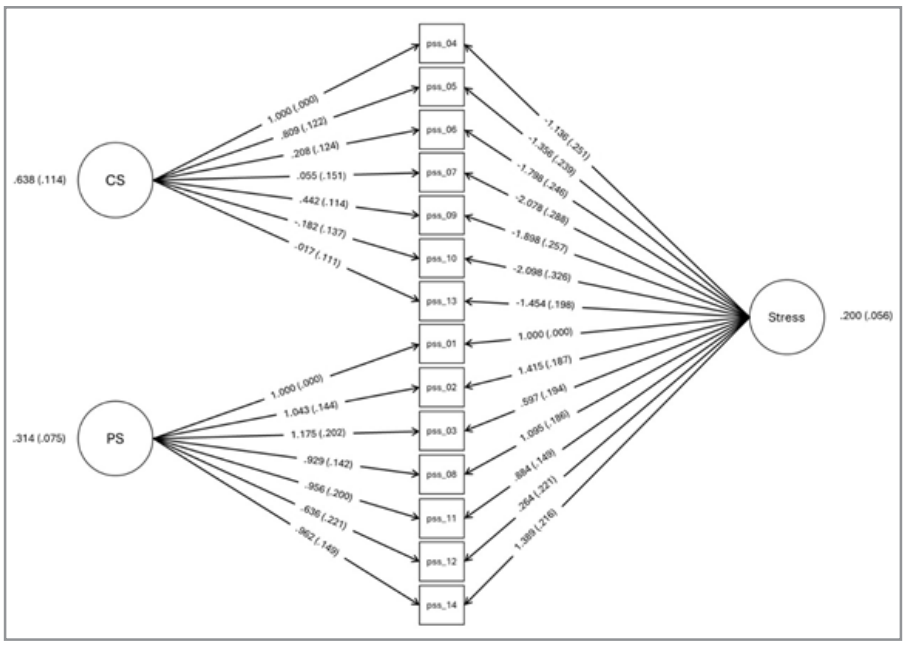

Figure 1: Confirmatory Factor Analysis of the Bifactor Model
Note: Perceived Stress (PS) and Coping with Stress(CS)

Standardized factor loadings (See Table 2) were significant for most items, ranging from 0.353 to 0.929, indicating that the majority of items aligned well with the theoretical constructs assessed. The Positive factor was particularly well-represented by items PSS_04 (¿"In the last month, how often have you successfully handled small irritating life problems?") and PSS_05 ("In the last month, how often have you effectively dealt with important changes occurring in your life?"), with high loadings of 0.799 and 0.646, respectively. Similarly, the Negative factor was strongly represented by items PSS_03 ("In the last month, how often have you felt nervous or stressed?") and PSS_02 ("In the last month, how often have you felt unable to control the important things in your life?"), with loadings of 0.658 and 0.584. Although the RMSEA index (0.140; 90% CI: 0.110–0.170) exceeds the recommended range for acceptable fit (<0.08), other fit indicators, such as the CFI (0.941), TLI (0.915), and SRMR (0.063), suggest an adequate overall model fit. These results underscore the potential of the bifactor model to capture the complexities of perceived stress while highlighting the need for ongoing refinement to further improve fit indices.

Table 2: Factor Loadings of the Bifactor Model

Item	Factor	Factor Loading	Standard Error	Est./S.E.	p-Value
PSS_01	PS	0.56	0.067	8.387	<0.001
PSS_01	STRESS	0.447	0.063	7.13	<0.001
PSS_02	PS	0.584	0.058	10.151	<0.001
PSS_02	STRESS	0.633	0.048	13.228	<0.001
PSS_03	PS	0.658	0.09	7.305	<0.001
PSS_03	STRESS	0.267	0.091	2.932	0.003
PSS_04	CS	0.799	0.071	11.174	<0.001
PSS_04	STRESS	-0.508	0.103	-4.924	<0.001
PSS_05	CS	0.646	0.084	7.674	<0.001
PSS_05	STRESS	-0.606	0.092	-6.605	<0.001
PSS_06	CS	0.167	0.102	1.637	0.102
PSS_06	STRESS	-0.804	0.052	-15.593	<0.001
PSS_07	CS	0.044	0.121	0.362	0.717
PSS_07	STRESS	-0.929	0.042	-22.05	<0.001
PSS_08	PS	0.52	0.055	9.543	<0.001
PSS_08	STRESS	0.49	0.062	7.946	<0.001
PSS_09	CS	0.353	0.097	3.62	<0.001
PSS_09	STRESS	-0.849	0.061	-13.987	<0.001
PSS_10	CS	-0.145	0.102	-1.417	0.156
PSS_10	STRESS	-0.938	0.055	-17.13	<0.001
PSS_11	PS	0.536	0.082	6.548	<0.001
PSS_11	STRESS	0.395	0.064	6.203	<0.001
PSS_12	PS	0.356	0.117	3.051	0.002
PSS_12	STRESS	0.118	0.101	1.165	0.244
PSS_13	CS	0.014	0.088	0.155	0.876
PSS_13	STRESS	-0.65	0.066	-9.782	<0.001
PSS_14	PS	0.539	0.062	8.722	<0.001
PSS_14	STRESS	0.621	0.057	10.968	<0.001

Notes: PS: Perceived Stress CS: Coping with Stress

However, some items exhibited performance issues. PSS_06 ('In the last month, how often have you felt confident about your ability to handle your personal problems?') and PSS_07 ('In the last month, how often have you felt that things were going well for you?') displayed low factor loadings on the POSIT factor (0.167 and 0.044, respectively) and were not statistically significant ($p = 0.102$ and $p = 0.717$). This indicates that these items may not be pertinent in the context of pediatric emergency departments. Similarly, PSS_13 ('In the last month, how often have you been able to control the way you spend your time?') was also non-significant (loading = 0.014, $p = 0.876$), likely reflecting that personal time management is not a central concept in this high-demand setting. Additionally, PSS_12 ('In the last month, how often have you thought about the things you need to get done?') showed limited explanatory power, with the lowest variance explained ($R^2 = 0.141$), categorizing it as a weak item. These findings underscore the need to re-evaluate these items to ensure their relevance and applicability in high-pressure work environments.

In the general stress factor (Stress), most items exhibited high and significant factor loadings (See Table 3), reinforcing the validity of a general perceived stress construct. However, item PSS_12 again showed a low loading (0.118) and was not significant (p = 0.244), which supports the notion that this item may only marginally contribute to the model. Additionally, PSS_06 and PSS_07, which previously indicated issues in the Perceived Stress factor, also showed negative and very high loadings in this factor (-0.804 and -0.929, respectively), while remaining non-significant in Perceived Stress. This implies that these items may inconsistently measure aspects of coping or general stress.

Table 2: Factor Loadings of the Bifactor Model

Item	R^2	S.E	Est/S.E.	p-Value	RV	Level	R^2	S.E	Est/S.E.	p-Value	RV	Level
PSS_01	0.316	0.069	4.597	<0.001	0.684	MVE	0.514	0.087	5.889	<0.001	0.486	MVE
PSS_02	0.549	0.065	8.455	<0.001	0.451	GVE	0.742	0.076	9.727	<0.001	0.258	GVE
PSS_03	0.218	0.073	2.982	0.003	0.782	LVE	0.504	0.111	4.525	<0.001	0.496	MVE
PSS_04	0.419	0.075	5.562	<0.001	0.581	MVE	0.896	0.099	9.087	<0.001	0.104	HVE
PSS_05	0.513	0.076	6.784	<0.001	0.487	GVE	0.785	0.082	9.594	<0.001	0.215	GVE
PSS_06	0.63	0.063	9.97	<0.001	0.37	GVE	0.674	0.065	10.335	<0.001	0.326	GVE
PSS_07	0.786	0.058	13.602	<0.001	0.214	HVE	0.865	0.071	12.22	<0.001	0.135	HVE
PSS_08	0.371	0.076	4.889	<0.001	0.629	MVE	0.51	0.085	5.99	<0.001	0.49	MVE
PSS_09	0.768	0.062	12.415	<0.001	0.232	HVE	0.845	0.056	15.17	<0.001	0.155	HVE
PSS_10	0.705	0.064	11.02	<0.001	0.295	HVE	0.901	0.115	7.855	<0.001	0.099	HVE
PSS_11	0.248	0.063	3.937	<0.001	0.752	LVE	0.443	0.098	4.501	<0.001	0.557	MVE
PSS_12	0.042	0.042	1.003	0.316	0.958	VLVE	0.141	0.089	1.581	0.114	0.859	LVE
PSS_13	0.376	0.082	4.599	<0.001	0.624	MVE	0.423	0.086	4.898	<0.001	0.577	MVE
PSS_14	0.522	0.077	6.788	<0.001	0.478	GVE	0.676	0.086	7.906	<0.001	0.324	GVE

Note: R^2 R-Squared (Standard). SE: Standard Error. P: p-Value. RV: Residual Variance. MVE: Moderate variance explained. GVE: Good variance explained, LVE: Low variance explained. VLVE: Very low variance explained. HVE: High variance explained.

Discussion

The preliminary findings of the PSS-14 analysis among emergency department health personnel support the evidence for a bifactor structure of the scale rather than a unidimensional one. These findings align with the theoretical proposition that the scale assesses both stress perception and coping strategies [2,10,15,16], while also capturing an underlying general dimension [11]. Consequently, summative calculations of all items are not suitable for determining the stress levels of healthcare personnel. The reliability analysis aligns with findings from previous studies, which have reported that the subscale for negative items typically exhibits higher reliability compared to the subscale for positive items [15].

Despite the positive findings, this analysis has several limitations. First, the RMSEA index (0.140) indicates a suboptimal model fit, likely influenced by the relatively small sample size (n = 65) and the complexity of the specified model. Additionally, some items showed low explained variances ($R^2 < 0.20$), suggesting a limited contribution to the theoretical construct they represent. These limitations underscore the need for potential adjustments to the model structure, such as revising item-factor relationships or increasing the sample size to improve the precision of the estimates. Moreover, as the data were derived from a specific sample, caution is warranted when generalizing the findings to other populations."

Given the episodic and variable nature of stress in pediatric emergency settings, adapting stress evaluation tools to shorter recall periods, such as weekly assessments, may better capture acute and situational stressors. This modification would enhance the validity and practical utility of these tools in both research and clinical contexts. Additionally, certain items in the PSS-14 scale were identified as less relevant for this context, highlighting the need for targeted refinements to align the instrument with the realities of pediatric emergency care. Stress assessment tools must reflect the contextual and functional demands of healthcare work to ensure their accuracy and applicability [16].

Tailored stress assessment tools not only improve the accuracy of evaluations but also guide interventions that promote mental health, enhance patient care, and cultivate healthier work environments. Interventions should concentrate on strengthening coping mechanisms, addressing both positive and negative aspects of stress. Collaboration among researchers, clinicians, and scale developers is crucial to maintaining the ongoing relevance of these tools and the creation of evidence-based solutions for healthcare professionals.

Refining the PSS-14 scale and aligning it with the evolving challenges faced by pediatric emergency personnel will enhance its practical relevance. These efforts can greatly contribute to the well-being of healthcare workers and the creation of more sustainable and supportive work environments.

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Data Availability Statements
The data supporting this article are available within the article itself, and in its online supplementary material. Additional data will be made available upon request.

Conflict of Interest Statement
The authors declare no conflicts of interest related to the content of this work.

Declaration of Generative AI in Scientific Writing
Due to the primary author's native language being Spanish, ChatGPT, an AI language model developed by OpenAI, was used for English language correction and refinement during the preparation of this work. After using this tool, the authors reviewed and edited the content as necessary and assume full responsibility for the content of the publication.

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