# Psychometric evaluation of the Resilience at Work Scale (RAW Scale - Brazil)

*Avaliação psicométrica da Escala de Resiliência no Trabalho (RAW Scale – Brasil)*

*Evaluación psicométrica de la Escala de Resiliencia Laboral (RAW Scale - Brasil)*

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**ABSTRACT**

**Objectives:** to analyze the validity of the Resilience at Work Scale (RAW Scale – Brazil), 25 and 20-item versions, based on its internal structure (dimensional and correlation), with professors and health workers from a public university in southern Brazil. **Methods:** methodological study, developed in 2018, with 526 participants. For psychometric tests, the following were used: Confirmatory Factor Analysis; composite reliability, and convergent validity against the Engagement at work; Occupational self-efficacy; Overall resilience; General Health Questionnaire; and Social support at work scales. **Results:** both versions had factor loadings > 0.30, adequate fit indices and satisfactory composite reliability. In both versions, strong and direct correlations with general Resilience and Self-efficacy were evidenced; moderate and direct with social Engagement and Support; and moderate and inverse with General Health. **Conclusions:** the RAW Scale 25 and 20 – Brazil meets the validity requirements with potential for assessing resilience at work within the studied context. **Descriptors:** Validation Studies; Psychological Resilience; Occupational Health; Work; Psychometrics.

**RESUMO**

**Objetivos:** analisar a evidência de validade baseada na estrutura interna (dimensional e de correlação) da Escala de Resiliência no Trabalho (RAW Scale – Brasil), versões 25 e 20 itens, com docentes e trabalhadores da saúde de uma universidade pública do Sul do Brasil. **Métodos:** estudo metodológico, desenvolvido em 2018, com 526 participantes. Nos testes psicométricos, utilizaram-se: Análise Fatorial Confirmatória; confiabilidade composta e validade convergente com Engajamento no trabalho; Autoeficácia ocupacional; Resiliência geral; Questionário Geral de Saúde; e Apoio social no trabalho. **Resultados:** as duas versões apresentaram cargas fatoriais > 0,30, índices de ajuste adequados e confiabilidade composta satisfatória. Nas duas versões, evidenciaram-se correlações forte e direta com Resiliência geral e Autoeficácia; moderada e direta com Engajamento e Apoio social; e moderada e inversa com Saúde geral. **Conclusões:** a RAW Scale 25 e 20 – Brasil atende aos requisitos de validade, com potencial para a avaliação de resiliência no trabalho no contexto estudado. **Descritores:** Estudos de Validação; Resiliência Psicológica; Saúde do Trabalhador; Trabalho; Psicometria.

**RESUMEN**

**Objetivos:** analizar evidencia de validez basada en estructura interna (dimensional y de correlación) de la Escala de Resiliencia Laboral (RAW Scale – Brasil), versiones 25 y 20 ítems, con docentes y trabajadores de salud de una universidad pública del Sur brasileño. **Métodos:** estudio metodológico, desarrollado en 2018, con 526 participantes. En las pruebas psicométricas, se utilizaron: Análisis Factorial Confirmatorio; confiabilidad compuesta y validez convergente con Compromiso laboral; Autoeficacia ocupacional; Resiliencia general; Encuesta General de Salud; y Apoyo social laboral. **Resultados:** las dos versiones presentaron cargas factoriales > 0,30, índices de ajuste adecuados y confiabilidad compuesta satisfactoria. En las dos versiones, evidenciadas correlaciones fuerte y directa con Resiliencia general y Autoeficacia; moderada y directa con Compromiso y Apoyo social; y moderada e inversa con Salud general. **Conclusiones:** la RAW Scale 25 y 20 – Brasil atiende a los requisitos de validez, con potencial para la evaluación de resiliencia laboral en el contexto estudiado. **Descriptores:** Estudio de Validación; Resiliencia Psicológica; Salud Laboral; Trabajo; Psicometría.

## INTRODUCTION

The concept of resilience is considered complex, lacking a universal definition. However, there is consensus that it involves the ability to tolerate or overcome adversity and unpleasant events and successfully adjust to and prepare for change and uncertainty[1-2].

Likewise, there is conceptual complexity when this term is adopted for work environments. From this perspective, it is important to consider the context of organizations, which try to respond and adapt to competitive global markets, as well as changes related to the social, technological, and climate environment[1]. On the other hand, there's an increase in the workload and personal stress levels[1]. Thus, enhancing or finding opportunities to apply individual strengths at work can favor growth, development, and satisfaction[3], that is, it can contribute to the development of work resilience.

The assessment of personal resilience at work provides important self-awareness for workers as well as support for organizations in planning actions to foster resilience, health, and quality of life. The *Resilience at Work Scale* (RAW Scale) is an instrument designed for this purpose by researchers from Working with Resilience and the University of South Australia[2]. Initially, it is a scale composed of 20 items and seven factors: *Living Authentically*, *Finding your Calling*, *Maintaining Perspective*, *Managing Stress*, *Interacting Cooperatively*, *Staying Healthy*, and *Building Networks*[2]. Later, a 25-item version was also proposed, which is used more in clinical practice with workers. For each question, the participant indicates their agreement with the items, based on a seven-point Likert scale (0-6), ranging from "strongly disagree" (0) to "strongly agree" (6). In the analyses, items nine and 11 have a reverse score in both versions (20 and 25 items)[2].

The RAW Scale was created and validated for the Australian workforce in 2013, with the participants drawn from health, education in general, commerce, information technology, finance, manufacturing, among others[2]. Several countries are conducting studies utilizing the English version of the RAW Scale. These include India, Australia, England, Ireland, and the United States of America[4]. Not all research being done among these countries have been published as of yet[4].

In India, the psychometric analysis of the RAW Scale was carried out with information technology workers, managers, and engineers[5]. The analysis highlighted the exclusion of three questions, which resulted in a 17-item and six factor scale[5]. In an Australian research with university students, the RAW Scale was adapted by changing the term "work" with "university", preserving the structure with 20 items, but grouping six factors that explained 63.7% of variance[6]. Despite being something recent, review studies recommend its use as it is a more contextualized model for measuring resilience in work and that allows interventions to promote resilience[7-8].

This scale did not have a version adapted to the Brazilian context, but it has an adequate psychometric performance in other contexts such as Australia[2] and India[5]. Considering this, in 2018, the RAW Scale 20 and 25 items underwent a rigorous process of cross-cultural adaptation to Brazilian Portuguese[9-10]. Conceptual, semantic, operational, and measurement equivalences were evaluated[10]. This article presents the measurement equivalence using dimensional validity.

It can be used in the worker's clinical practice, favoring the organization with strategies both to promote individual resilience and organizational management. Furthermore, it is highlighted that the use of the RAW Scale helps nurses to reflect on the health care of workers, enabling them to support actions that minimize the negative effects of adversity and work stress.

## OBJECTIVES

To analyze the validity of the Resilience at Work Scale (RAW Scale – Brazil), 25 and 20-item versions, based on its internal structure (dimensional and correlation), with professors and health workers from a public university in southern Brazil.

## METHODS

### Ethical aspects

All ethical principles according to the precepts established by Resolution 466/2012 of the National Health Council were respected, and the research project was approved by the Research Ethics Committee.

### Study design, period, and location

Methodological study, with emphasis on the psychometric assessment of the RAW Scale – Brazil, after a careful cross-cultural adaptation process[10]. Data collection took place from April to July 2018, at a public university in the state of Rio Grande do Sul (RS), Brazil.

### Population or sample; inclusion and exclusion criteria

A total of 526 workers participated in the study, being 242 professors and 283 health workers. Included, were all professors from the university, from technical, technological, and child education areas, as well as health workers from the university hospital of that institution. Those who were on leave (maternity, sick) during the data collection and those working less than one year at the institution were excluded. Participants were recruited individually, after drawing lots in the workplace.

### Study protocol

Data collection was done through a self-administered questionnaire by the participants, who were approached on the institution's premises by collectors previously trained and certified by the project coordinator. The questionnaire included sociodemographic (age, sex, race, marital status, profession) and labor (highest title, time since graduation, time in service, time working at the institution, workplace, workload) variables. The Job Stress Scale[11], General Health Questionnaire (GHQ-12), which assesses psychological well-being[12], Resilience Scale[13], which evaluates resilience in general; the Utrecht Work Engagement Scale[14], Occupational Self-Efficiency Scale[15], and RAW Scale 25 and 20 – Brazil were also included.

RAW is a scale that has two versions, one with 25 and the other with 20 items, arranged in seven dimensions: Living authentically (four/three items, respectively), Finding your calling (four items), Maintaining perspective (four items), Managing stress (four/three items, respectively), Interacting cooperatively (three/two items, respectively), Staying healthy (three/two items, respectively), Building networks (three/two items, respectively). In RAW 20, items 4, 12, 19, 22, and 25[2] are excluded.

## Analysis of results and statistics

Data was inputted into the Epi-info® program, version 6.4, with independent double typing. After checking for typing errors and inconsistencies, data analysis was performed using the R® program (R CORE TEAM, 2016), Lavaan package. Descriptive statistics were used to characterize the sample. The equation for analyzing the resilience score at work, due to Australian authorship copyright issues, will not be released. Authorization for future research can be requested on the Website: workingwithresilience.com.au or email contact@workingwithresilience.com.au.

### 1st Stage: Construct validity indicators based on internal structure

First, an assessment of the RAW Scale factorial structure was carried out through confirmatory factor analyses (CFA). For the CFA, the ordinal measurement level of items was considered; the analysis was conducted from the matrix of polychoric correlations of the RAW Scale - Brazil items and the *Diagonally Weighted Least Squares* (DWLS) estimation method with robust standard errors was used. To interpret how the model fit the data, the following indexes were considered: *Comparative Fit Index* (CFI ≥ 0.90), *Tucker-Lewis Index* (TLI ≥ 0.90), and *Root Mean Square Error of Approximation* (RMSEA ≤ 0.06). The correlation between the scale factors was also performed, using the 0.80 limit as a parameter.

### 2nd Stage: Convergent validity indicators

Correlations against the Engagement at Work[14], Occupational Self-efficacy[15], Overall Resilience[13], General Health Questionnaire[12], and Social Support at Work[11] scales were performed according to the types of variables analyzed. In this context, the validity of the correlational construct (convergent validity) was assessed using Spearman's correlation. In the correlations, the following reference rates were adopted: from 0.1 to 0.29 - weak correlation; from 0.3 to 0.49 - moderate correlation; and rates greater than 0.5 - strong correlation.

### 3rd Stage: Reliability indicators

The reliability of items was estimated in two ways, the Cronbach's alpha index and the composite reliability, through Raykov's equation, also called Mcdonald's Omega. Both reliability indicators are considered acceptable with values ≥ 0.70[16].

## RESULTS

The average age was 43.97 years (SD=10.06; Min=23 Max=74) with a prevalence of females (64.6%), of workers who were married/with a partner (66.5%), and white (92.2%). With regards to labor variables, most were professors (45.4%). Among health workers, there was a predominance of nursing technicians (16.9%) and nurses (11.8%). With regards to level of education and working hours, 86.3% had a graduate degree and 54.6% had a 40-hour weekly workload. The mean time since graduation was 18.8 years (SD=10.3; Min=2, Max.=48). The mean time working at the university and the hospital were, respectively, 14.4 (SD=10.3; Min=1, Max=45) and 2.9 (SD=0.8; Min=1, Max=4) years.

### 1st Stage: Factorial Structure

The factorial structure was initially verified by Confirmatory Factor Analysis (CFA). Both models had adjustments according to the indexes considered in this study. The model of the 25-item version of the instrument was adjusted to the data, with Chi-Square (254) = 884.1, CFI = 0.93, TLI = 0.91, RMSEA (90% CI) = 0.069 (0.064-0.074). Likewise, the shorter version of the instrument, with 20 items, also adjusted well with the data, with Chi-Square (149) = 515.8, CFI = 0.95, TLI = 0.93, RMSEA (90% CI) = 0.069 (0.062-0.075). The factorial loads were all adequate, above 0.30[17], and the reliability measures were adequate for most subscales (e.g., ≥ 0.7).

The RAW Scale 25 - Brazil CFA is shown in Table 1.

The Confirmatory Factor Analysis of the RAW Scale 20 - Brazil is shown in Table 2.

**Table 1** – Confirmatory factor analysis of the seven-factor structure of the RAW Scale 25 instrument – Brazil, Santa Maria, Rio Grande do Sul, Brazil, 2018, (N = 526)

| RAW Scale 25 – Brazil items | $F_1$ | $F_2$ | $F_3$ | $F_4$ | $F_5$ | $F_6$ | $F_7$ |
|---|---|---|---|---|---|---|---|
| 1. I have core values, which I bring to my work-life. | 0.60 | | | | | | |
| 2. I know my personal strengths and make sure I use them regularly in my work. | 0.72 | | | | | | |
| 3. I can change my mood at work when I need to. | 0.36 | | | | | | |
| 4. I know myself and my feelings honestly and realistically. | 0.67 | | | | | | |
| 5. The work that I do helps fulfil my sense of purpose in life. | | 0.65 | | | | | |
| 6. My workplace is a place where I feel that I belong. | | 0.85 | | | | | |
| 7. The work that I do fits well with my personal values and beliefs. | | 0.71 | | | | | |
| 8. Generally I appreciate what I have in my work environment. | | 0.67 | | | | | |
| 9. When things go wrong at work, it tends to negatively affect other parts of my life. (R)* | | | 0.32 | | | | |
| 10. Nothing at work ever really upsets me for long. | | | 0.63 | | | | |
| 11. Negative people at work tend to bring me down. (R)* | | | 0.32 | | | | |
| 12. When problems arise at work, I focus on finding a solution rather than just worrying about them. | | | 0.67 | | | | |
| 13. I make sure to take breaks to maintain my strength and energy when I'm working too hard. | | | | 0.61 | | | |
| 14. I have developed some reliable ways to relax when I'm under pressure at work. | | | | 0.88 | | | |
| 15. I have developed some reliable ways to deal with the stress of challenging events at work. | | | | 0.91 | | | |
| 16. I am careful to ensure my work does not "dictate" my personal life. | | | | 0.61 | | | |
| 17. I often ask for feedback so that I can improve my work performance. | | | | | 0.57 | | |
| 18. I believe in helping my work colleagues, as well as asking them for help. | | | | | 0.72 | | |
| 19. I'm not afraid to seek advice and support if and when I need help with my work. | | | | | 0.81 | | |
| 20. I have a good level of physical fitness. | | | | | | 0.70 | |

To be continued

Table 1 (concluded)

| RAW Scale 25 – Brazil items | F₁ | F₂ | F₃ | F₄ | F₅ | F₆ | F₇ |
|---|---|---|---|---|---|---|---|
| 21. I am careful about eating well and healthily. | | | | | | 0.70 | |
| 22. Keeping physically fit helps me cope with work demands. | | | | | | 0.79 | |
| 23. I have friends at work I can rely on to support me when I need help. | | | | | | | 0.84 |
| 24. I have a strong and reliable network of supportive colleagues at work. | | | | | | | 0.87 |
| 25. My personal support network is important to my coping at work. | | | | | | | 0.66 |
| Cronbach's alpha | 0.66 | 0.80 | 0.58 | 0.82 | 0.70 | 0.77 | 0.82 |
| Composite reliability (McDonald's Omega) | 0.56 | 0.78 | 0.50 | 0.84 | 0.71 | 0.72 | 0.81 |

*(R): Inverted-recoded item before analysis.*
*F1, F2, F3, F4, F5, F6, F7: standardized factor loadings on factors 1 (Living authentically), 2 (Finding your calling), 3 (Maintaining perspective), 4 (Managing stress), 5 (Interacting cooperatively), 6 (Staying healthy) and, 7 (Building networks). The scale was originally created by Winwood, Colon, and Mc Ewen(2). Due to copyright, the analysis type must be requested, through the website workingwithresilience.com.au, or through the email address contact@workingwithresilience.com.au.*
*Adjustment indexes: RMSEA = 0.06 (CI=0.061 – 0.071); CFI = 0.93 e TLI= 0.91; $X^2(254) = 884.1$.*

**Table 2** – Confirmatory factor analysis of the 7-factor RAW Scale 20 – Brazil, Santa Maria, Rio Grande do Sul, Brazil, 2018, (N = 526)

| RAW Scale 20 – Brazil items | F1 | F2 | F3 | F4 | F5 | F6 | F7 |
|---|---|---|---|---|---|---|---|
| 1. I have core values, which I bring to my work-life. | 0.61 | | | | | | |
| 2. I know my personal strengths and make sure I use them regularly in my work. | 0.82 | | | | | | |
| 3. I can change my mood at work when I need to. | 0.37 | | | | | | |
| 5. The work that I do helps fulfil my sense of purpose in life. | | 0.64 | | | | | |
| 6. My workplace is a place where I feel that I belong. | | 0.86 | | | | | |
| 7. The work that I do fits well with my personal values and beliefs. | | 0.71 | | | | | |
| 8. Generally I appreciate what I have in my work environment. | | 0.67 | | | | | |
| 9. When things go wrong at work, it tends to negatively affect other parts of my life. (R)* | | | 0.48 | | | | |
| 10. Nothing at work ever really upsets me for long. | | | 0.80 | | | | |
| 11. Negative people at work tend to bring me down. (R)* | | | 0.45 | | | | |
| 13. I make sure to take breaks to maintain my strength and energy when I'm working too hard. | | | | 0.61 | | | |
| 14. I have developed some reliable ways to relax when I'm under pressure at work. | | | | 0.90 | | | |
| 15. I have developed some reliable ways to deal with the stress of challenging events at work. | | | | 0.90 | | | |
| 16. I am careful to ensure my work does not "dictate" my personal life. | | | | 0.60 | | | |
| 17. I often ask for feedback so that I can improve my work performance. | | | | | 0.54 | | |
| 18. I believe in helping my work colleagues, as well as asking them for help. | | | | | 0.58 | | |
| 20. I have a good level of physical fitness. | | | | | | 0.77 | |
| 21. I am careful about eating well and healthily. | | | | | | 0.65 | |
| 23. I have friends at work I can rely on to support me when I need help. | | | | | | | 0.83 |
| 24. I have a strong and reliable network of supportive colleagues at work. | | | | | | | 0.90 |
| Cronbach's alpha | 0.60 | 0.80 | 0.61 | 0.82 | 0.49 | 0.67 | 0.85 |
| Composite reliability (McDonald's Omega) | 0.58 | 0.78 | 0.58 | 0.84 | 0.41 | 0.63 | 0.82 |

*(R): Inverted-recoded item before analysis.*
*F1, F2, F3, F4, F5, F6, F7: standardized factor loadings on factors 1 (Living authentically), 2 (Finding your calling), 3 (Maintaining perspective), 4 (Managing stress), 5 (Interacting cooperatively), 6 (Staying healthy) and, 7 (Building networks). The scale was originally created by Winwood, Colon, and Mc Ewen(2). Due to copyright, the analysis type must be requested, through the website workingwithresilience.com.au, or through the email address contact@workingwithresilience.com.au.*
*Adjustment indexes: RMSEA = 0.06 (IC = 0.062 – 0.075); CFI = 0.95 e TLI = 0.93; $\chi^2(149) = 515.8$*

**Table 3** - Correlations between factors of the RAW Scale - Brazil 25 and 20 items, Santa Maria, Rio Grande do Sul, Brazil, 2018, (N = 526)

| RAW Scale Factors - Brazil 25 and 20 items | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. Living authentically | 1 | 0.471 | 0.151 | 0.280 | 0.578 | 0.295 | 0.214 |
| 2. Finding your calling | 0.481 | 1 | 0.316 | 0.245 | 0.579 | 0.362 | 0.610 |
| 3. Maintaining perspective | 0.476 | 0.487 | 1 | 0.557 | 0.299 | 0.363 | 0.250 |
| 4. Managing stress | 0.402 | 0.247 | 0.557 | 1 | 0.492 | 0.534 | 0.205 |
| 5. Interacting cooperatively | 0.481 | 0.515 | 0.518 | 0.383 | 1 | 0.259 | 0.639 |
| 6. Staying healthy | 0.420 | 0.390 | 0.450 | 0.535 | 0.270 | 1 | 0.288 |
| 7. Building networks | 0.274 | 0.632 | 0.343 | 0.219 | 0.615 | 0.284 | 1 |

*Bivariate correlations among the RAW scale factors. On the lower diagonal are the correlations for the 25-item version, while on the upper diagonal are the correlations for the 20-item version of the instrument. All correlations are significant at the 5% level.*

Regarding the correlation between factors of the RAW Scale 20 - Brazil and the RAW Scale 25 - Brazil, no correlation among the seven factors was above the limit of 0.80. In the RAW Scale 25 - Brazil, the values varied from 0.219 (between F4 - Managing stress and F7 - Building networks), to 0.632 (between F2 - Finding your calling and F7 - Building networks). In the RAW Scale 20 - Brazil, the values varied from 0.151 (between F1 - Living authentically and F3 - Maintaining perspective); to 0.639 (between F5 - Interacting cooperatively and F7 - Building networks). The correlations between factors of the RAW Scale 25 and 20 - Brazil are presented in Table 3.

**2nd Stage: Convergent correlational validity**

The correlations between RAW Scale 25 and 20 - Brazil and the analyzed constructs varied from strong to moderate, they are displayed in Table 4.

The RAW Scale 25 and 20 - Brazil correlated strongly and positively with the General Resilience Scale (r = 0.590 and 0.580, respectively) and Occupational self-efficacy (r = 0.578 and r = 0.577, in this order); with moderate strength and positively with Engagement (r = 0.445 and r = 0.436, respectively), and Social support (r = 0.462

and r = 0.452, respectively). On the other hand, with Psychological well-being (General Health Questionnaire-GHQ), the two versions correlated with moderate strength and in the opposite direction (RAW Scale 25 - Brazil r = -0.462; RAW Scale 20 – Brazil r = -0.455).

**Table 4 -** Correlations between RAW Scale 25 and 20 - Brazil and the constructs of General health, General resilience, Engagement at work, Social support, and Occupational self-efficacy, Santa Maria, Rio Grande do Sul, Brazil, 2018, (N = 526)

| Variables | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| RAW Scale 25 – Brazil | | | | | | |
| 1. RAW Scale 25 – Brazil | 1 | | | | | |
| 2. General health | -0.462* | 1 | | | | |
| 3. Engagement at work | 0.445* | -0.317* | 1 | | | |
| 4. General resilience | 0.590* | -0.292* | 0.493* | 1 | | |
| 5. Social support | 0.462* | -0.412* | 0.336* | 0.159* | 1 | |
| 6. Occupational self-efficacy | 0.578* | -0.393* | 0.456* | 0.517* | 0.381* | 1 |
| RAW Scale 20 – Brazil | | | | | | |
| 1. RAW Scale 20 – Brazil | 1 | | | | | |
| 2. General health | -0.455* | 1 | | | | |
| 3. Engagement at work | 0.436* | -0.317* | 1 | | | |
| 4. General resilience | 0.580* | -0.292* | 0.493* | 1 | | |
| 5. Social support | 0.452* | -0.412* | 0.336* | 0.159* | 1 | |
| 6. Occupational self-efficacy | 0.577* | -0.393* | 0.456* | 0.517* | 0.381* | 1 |

*Note: *Correlation is significant at the 1% level.*

## DISCUSSION

This study, given that the RAW Scale already presents a dimensional proposal, commenced with a CFA, which allows an item conjecture representation based on theory, using its manifested indicators which are, at first, linked to the respective assumable factors[18]. Thus, we used the seven-factor structure that includes the original RAW containing 25 and 20 items[2].

For evidence of validity based on the internal dimensional structure, the 25-item RAW scale does not have research to evaluate its psychometric properties. This means that it is not possible to compare the findings with other studies. However, in this study it was found, in the CFA of the two versions of the RAW Scale - Brazil (25 and 20 items), that the factor loadings of the items in each analyzed subscale were greater than 0.30. In the RAW Scale 25 - Brazil, items three, nine, and 11 stand out with the lowest factor loadings (0.36, 0.32, and 0.32 respectively). The other factorial loads of the items ranged from 0.57 to 0.91. In RAW Scale 20 - Brazil, items three, nine, and 11 also had the lowest factor loadings (0.37, 0.48 and 0.45, respectively). The factorial loads of the other items ranged from 0.54 to 0.90. The adjustment indexes were adequate in both versions of the scale.

It is important to highlight that the RAW Scale was created within a developed country scenario; in this sense, it's worth reflecting that the economic, social, and political structures, as well as the working conditions in Brazil, differ greatly from those of the Australian context. Although the population of the original study is privileged with regards to education and income, the reality of work in Brazil is very different from that of Australia, which can have an impact on the interpretation of items by respondents.

The Indian study, when testing the RAW Scale with 17 items and six factors in the CFA, deemed it reliable, with adequate adjustment indexes of (RMSEA = 0.05, CFI = 0.96, $\chi^2$ (180) = 286.2)[5]. When comparing items that presented a factor load close to 0.30 in the Brazilian version (items three, nine, and 11) with those from other studies, they worked differently. Item three, in the original version study, also had one of the lowest factor loads (0.541)[2], as well as in the adaptation of the RAW Scale to be used with university students (0.49)[6]. The Indian study had a high factor load (0.881)[5]. This item refers to the ability to change one's mood, when required, to manage emotional responses under situations of stress at work. However, it could be interpreted within the Brazilian culture as the individual's integrality, such as a unique being, who cannot separate general life emotions from those that are work-related. That is, it does not necessarily suggest a divergence of behavior.

Item nine, in the original version[2], and in the study with university students[6], had a satisfactory factor load (-0.661 and 0.71, respectively). In the Indian study, this item was discarded due to the negligible factor load (0.10)[5]. For item 11, the original version[2] had a load of -0.548. In the other two researches with students[6] and the Indian worker population[5], the loads were high (0.83 and 0.886, respectively). In this sense, it is possible to think that perhaps these items may be showing interference regarding cross-cultural adaptation about idiomatic, semantic, or even cultural aspects, or even denote the possibilities of interpretation that the statement allows.

In addition, items nine and 11 are reverse items. In this sense, the reverse items can be more complex to understand, which can end up confusing the respondent[19]. In this perspective, the need of other psychometric studies with Brazilian workers is emphasized, to make it possible to deepen the discussions on the behavior of these items.

In most cases, when undertaking an instrument's CFA, unexpected disagreements may occur, which may be due to the population's heterogeneity[19]. Not all items will be interpreted as intended, with some confusing the participant or being understood in unexpected ways[19].

The correlations among the factors of the two versions of the RAW Scale - Brazil were less than 0.80, which shows discriminating factor validity. In the RAW Scale 25 – Brazil, the highest correlations were between the factors "Building networks" and "Finding your calling", and in the RAW Scale 20 - Brazil, between the factors "Interacting cooperatively" and "Building networks". An Indian study showed a variation of 0.21 to 0.55 among the factors "Staying healthy" and "Living authentically", "Building networks" and "Finding your calling"; and "Maintaining perspective" and "Finding your calling" (respectively)[5].

In this study, the strong correlation between the factors "Finding your calling" and "Building networks" may be a result of participants feeling that interpersonal relationships established at work give meaning to the work environment, and thus are able to find strength in this. Also, these connections can contribute to the feeling of belonging, adjustment of personal beliefs, which favors mutual support among colleagues to solve problem-situations. However, it is observed that each factor maintains distinct properties. For this reason, the discriminating factor validity was maintained. It is noteworthy that the Resilience at work construct comprises the

seven presented domains. Thus, domains should not be evaluated separately from the scale.

In this sense, the study showed convergent validity correlating strongly and positively with the General Resilience Scale and Occupational self-efficacy; moderate strength and positive sense with engagement and social support; and moderate strength and negative sense with Psychological well-being (general health). In the Australian validation of the RAW 20 items, there was a strong and positive correlation with Engagement at work (r = 0.53) and a strong and negative correlation with Psychological well-being (r = -0.55) [2]. An Indian study tested the relationship between Resilience and Engagement at work using the Structural Equation Model, which presented an excellent fit (GFI = 0.98; NFI = 0.96; CFI = 0.97; RMSEA = 0.05). The model outlined the standardized path coefficient between Resilience and Engagement at work with a direct relationship (β = 0.38; p<0.05) [5]. Although a different statistical analysis technique was used, the results agree with the findings of this study.

The characteristics related to the General resilience, Occupational self-efficacy, Engagement at work, and Social support constructs are in line with RAW's theoretical contribution, mainly with the domains "Living authentically", "Maintaining perspective", and "Building networks", as the first of these emphasizes the need for the worker to know how to and be able to use personal strengths at work and still have knowledge about their emotions and control them in challenging situations; the second is related to managing negativity and focusing on problem solving. The third, relates to a work or family support network that can provide practical help, perspective, and emotional support [3].

The aspects of Psychological well-being (General health) had a negative correlation with resilience at work, as expected. These results are theoretically supported in the domains "Managing stress", "Staying healthy", and "Maintaining perspective". In the "Managing stress" domain, we find individuals capable of keeping routines that can help reduce daily stress, maintain a balance between professional and personal life, and ensure recovery time; and within "Staying healthy" it is understood that, regardless of the work type, relates to the importance of maintaining physical and nutritional health, as these interfere with the cognitive and emotional skills of everyday life; "Maintaining perspective" is understood as the necessity of maintaining focus in the solving and managing of difficult and unfavorable situations.

From the existing correlations of the RAW Scale 25 and 20 - Brazil and its dimensions with the Resilience, Occupational self-efficacy, Psychological well-being, Engagement at work, and Social support constructs, it is observed that there is coherence of the instrument with the theoretical aspects that support it. Thus, it would be possible to conclude that the RAW Scale 25 and 20 - Brazil have convergent validity, considering that they are statistically correlated with aspects that have a theoretical connection.

The internal consistency of the RAW Scale 25 - Brazil (α = 0.83) was satisfactory. These findings agree with the results of other studies: 0.84 [2], and 0.81 [5]. When the factors were evaluated, moderate internal consistency indexes were observed in the "Living authentically", "Finding your calling", and "Interacting cooperatively" domains. With the scale adapted for students [6], the RAW presented a variation of Cronbach's α in the domains from 0.63 to 0.79. An original study [2] showed a variation from 0.60 to 0.89, and an Indian

study [5], although with a different structure of items and factors, showed a variation of Cronbach's α between 0.76 to 0.84.

In this sense, considering an acceptable compound reliability of 0.70 [16], we observed, in the "Maintaining perspective" domain (0.56-RAW Scale 25 - Brazil), indexes below the reference value. In an Indian study, they found compound reliability greater than 0.70 in the RAW domains with 17 items [5]. It is noteworthy that the compound reliability is influenced by the number of items and the homogeneity of the factorial loads [16]. From this perspective, in a general context, the compound reliability can be understood as adequate for this instrument, especially considering that it has less items in some domains, which can influence reliability. The findings regarding consistency validate the quality of the instrument, since an instrument that proves to be reliable in repeated measurement processes corroborates its operational potential for use in population studies [10,18].

### Study limitations

The limitations of the study are mainly related to the representativeness of the studied sample, since it includes but a portion of workers. The reassessment of low factor loadings and high residual items in RAW Scale 25 and 20 – Brazil is important, which will make it possible to improve the current instrument. It would also be relevant to investigate whether the measurement accuracy of RAW Scale 25 and 20 – Brazil is the same in all sample groups, such as gender, age, and type of work.

### Contributions to the Field

Two contributions stand out. First, the reflection on the possibility of investing in workers' health care in order to maintain or improve individuals' responses to adversity at work. Consequently, it could produce health, or minimize the negative effects of adversity and stress at work. Second, this study brings the methodological framework of psychometrics, which comes from epidemiological and psychological studies. The appropriation of these references contributes to the construction of knowledge in different areas of the nurse's work.

### CONCLUSIONS

The statistical procedures applied in this study concluded that the Resilience at Work (RAW Scale 25 and 20 - Brazil) is a reliable, valid instrument with strong psychometric properties for assessing resilience in the Brazilian work environment. This instrument can also assist in the development of actions and strategies to promote, maintain, or improve resilience at work.

### SUPPLEMENTARY MATERIAL

This manuscript is the result of a doctoral thesis, which can be found in the UFSM repository, via: https://repositorio.ufsm.br/handle/1/16353

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