

New Job Stress Scale: Factor and Convergent Validity, and Reliability

Wilza Karla dos Santos Leite^{1*}, Anísio José da Silva Araújo², Luiz Bueno da Silva³, Erivaldo Lopes de Souza⁴, Carlos Eduardo Pimentel⁵, Jonhatan Magno Norte da Silva⁶, Natália Lins Pequeno de Assis⁷, Emellyne Lima de Medeiros Dias Lemos⁸, Pierre Gonçalves de Oliveira Filho⁹

¹ <http://orcid.org/0000-0002-1405-1672> / Universidade Federal da Paraíba (UFPB), Brasil

² <http://orcid.org/0000-0002-3128-3897> / Universidade Federal da Paraíba (UFPB), Brasil

³ <http://orcid.org/0000-0003-4624-2075> / Universidade Federal da Paraíba (UFPB), Brasil

⁴ <http://orcid.org/0000-0002-7098-9438> / Universidade Federal da Paraíba (UFPB), Brasil

⁵ <http://orcid.org/0000-0003-3894-5790> / Universidade Federal da Paraíba (UFPB), Brasil

⁶ <http://orcid.org/0000-0003-4084-9511> / Universidade Federal de Alagoas (UFAL), Brasil

⁷ <http://orcid.org/0000-0001-7832-2761> / Universidade Federal da Paraíba (UFPB), Brasil

⁸ <http://orcid.org/0000-0003-1927-3132> / Universidade Federal da Paraíba (UFPB), Brasil

⁹ <http://orcid.org/0000-0001-5846-4551> / Universidade Federal da Paraíba (UFPB), Brasil

Abstract

To evaluate occupational stress, one of the most recent scales adapted for Portuguese is the short version of the 2004 Job Stress Scale (JSS). In 2016, a new English version called the New Job Stress Scale (NJSS) was developed. The objective of this paper was to adapt the NJSS, which measures a set of stressors related to work development, to the Portuguese language. A translated and adapted Portuguese version of the NJSS and the short and adapted Portuguese version of the JSS were applied, and 674 workers (industrial and services sector) from five Brazilian cities participated. A model with 20 items proved to be more adequate than the original ($\chi^2/df = 2.22$; CFI = .95; GFI = .96; TLI = .94; ECVI = 1.96; and, RMSEA = .08). It was concluded that the NJSS has a reliable factorial structure to measure occupational stress in Brazil.

Keywords: stress, occupational health, psychometrics.

Nova Escala de Estresse no Trabalho: Validade Fatorial, Convergente e Precisão

Resumo

Para avaliar o estresse ocupacional, uma das escalas mais recentes adaptadas para o português é a versão resumida da *Job Stress Scale* (JSS) que data do ano de 2004. Em 2016, uma nova versão em inglês denominada *New Job Stress Scale* (NJSS) foi desenvolvida. Objetivou-se adaptar para a língua portuguesa a NJSS, que mensura um conjunto de estressores relacionados ao desenvolvimento do trabalho. Foram aplicadas uma versão traduzida e adaptada para o português da NJSS e a versão resumida e adaptada para o português da JSS. Participaram 674 trabalhadores (setor industrial e de serviços) de cinco cidades brasileiras. Um modelo com 20 itens se mostrou mais adequado que o original ($\chi^2/df = 2,22$; CFI = 0,95; GFI = 0,96; TLI = 0,94; ECVI = 1,96; e, RMSEA = 0,08). Concluiu-se que a NJSS apresenta uma estrutura fatorial confiável para mensurar o estresse ocupacional no Brasil.

Palavras-chave: estresse, saúde ocupacional, psicometria.

La Nueva Escala de Estrés Laboral: Validez Factorial, Convergente y Fiabilidad

Resumen

La versión corta de la *Job Stress Scale* (JSS), creada en 2004, es una de las más recientes escalas para evaluar estrés laboral adaptadas al portugués. En 2016, fue desarrollada una nueva versión en inglés llamada *New Job Stress Scale* (NJSS). En esta investigación, el objetivo fue adaptar al portugués la NJSS, que mide un conjunto de factores estresantes relacionados con el desarrollo del trabajo. Se aplicaron una versión de la NJSS traducida y adaptada al portugués y la versión corta de la JSS también adaptada al portugués a una muestra de 674 trabajadores (de los sectores industrial y de servicios) de cinco ciudades brasileñas. Un modelo con 20 ítems demostró ser más adecuado que la versión original ($\chi^2/df = 2,22$; CFI = 0,95; GFI = 0,96; TLI = 0,94; ECVI = 1,96; y, RMSEA = 0,08). Se concluyó que la NJSS presenta una estructura factorial fiable para evaluar el estrés laboral en Brasil.

Palabras clave: estrés, salud laboral, psicometría.

Stress is an event that can be negatively assessed in terms of threat, loss, or damage; neutrally assessed; or positively assessed in terms of presenting a challenge (Schaufeli, 2015). High levels of occupational stress affect workers and organizations due to the repercussions on motivation, productivity, safety, and market competitiveness (Hongxia, Yongbin, Shuicheng, Fen, & Huan, 2014), generating direct and indirect costs. The effects vary according to the frequency, intensity, and duration of exposure to the stressor (Colligan & Higgins, 2006). Generally, stressors include work overload, conflict due to job expectations, low coworker support, and imbalance between work and personal life (Hongxia et al., 2014; Mackey, Perrewé, & McAllister, 2017; Schaufeli, 2015).

Exposure to stressor agents generates different responses in the body. For the first exposure, the response is acute and protective; when stressors are intermittent, the body may experience inflammatory processes. In cases where there is repeated exposure, stress becomes chronic (Rohleder, 2019) and can have different effects on workers, causing psychological, physical, and/or behavioral disorders (Hongxia et al., 2014; Mackey, Perrewé, & McAllister, 2017; Schaufeli, 2015). These implications affect the quality of life and the general well-being of workers, and there are indications that they may trigger the development of unhealthy lifestyle habits (Greiner, 2008), with serious consequences for long-term health (Rohleder, 2019; St-Hilaire & Gilbert, 2019).

Work overload is one of the main stressor agents (Khajuria & Nayak, 2018). It is understood as a stressor related to the quantity and quality of work that must be performed under certain time constraints (Mackey et al., 2017). Overload is said to be quantitative in the presence of discrepancies between the amount of work and the time available; and qualitative when, regardless of time, there is a feeling of inability to perform the work (Singh & Sharma, 2017).

Stressors related to role conflicts refer to the indeterminacy of work and the imprecision between the tasks and roles performed (Hongxia et al., 2014). There is a conflict when the requirements and duties of a function are not well prescribed and defined or when a worker is forced to perform two or more roles simultaneously, where the fulfillment of one makes it difficult or impossible to perform the other (Jin, Sun, Jiang, Wang, & Wen, 2017). This conflict generates an inconsistency of expectations regarding the job requirements and what is expected from the worker (Tarafdar, Tu, Ragu-Nathan, & Ragu-Nathan, et al., 2007).

Coworker support, on the other hand, refers to the relationships of support and social recognition among workers, which are important for the management of tensions (Hongxia et al., 2014), and their loss can accentuate the negative consequences of occupational stress (Kim, Hur, Moon, & Jun, et al., 2017). The social support provided by colleagues or supervisors has a moderating effect in situations of threat, improving the ability to cope with different work situations (Dawson, O'Brien, & Beehr, 2016). It involves physical, psychological, social, and organizational aspects, whose resources attenuate demands and stimulate the development of workers (Adil & Baig, 2018).

Several studies point out that the imbalance between work and personal life also influences the development of occupational stress, with negative repercussions on workers' health (Allen, Herst, Bruck, & Sutton, 2000; Hämmig, Brauchli, & Bauer, 2012; Laeque, 2014; Mackey et al., 2017). These impacts can permeate social contexts, causing interpersonal conflicts in various situations (Repetti & Wang, 2017) inside or outside the work environment. Conflict is related to feelings of distrust, competition, hostility (Hongxia et al., 2014), and difficulty in managing professional and

personal demands. The imbalance between work and personal life affects general well-being as well as job satisfaction, commitment, and performance in a negative sense (Laeque, 2014). Since they have limited remaining resources, workers exposed to high stress at work are presumed to experience greater interpersonal conflicts when compared to those not exposed (Mackey et al., 2017). Furthermore, one can admit that a negative effect in one of these domains (work or personal life) can feed back into the cycle (Hämmig et al., 2012).

To assess occupational stress, Alves, Chor, Faerstein, Lopes and Werneck (2004) performed an adaptation into Portuguese of short version of the Job Stress Scale, developed by Töres Theorell in Sweden in 1988, based on the questionnaire of Karasek (1979). This version contains 17 items for assessing demand, control, and coworker support. This scale is based on Karasek's (1979) demand-control model, which examines how the work process' demands and control are related to occupational stress. The demands pertain to sources of stress in the workplace in terms of physical and psychological overload; and control pertains to autonomy in decision-making on how and what to do at work. While demands accentuate occupational stress, job control minimizes it by providing flexibility to cope with stressors (Hessels, Rietveld, & van der Zwan, 2017). Work is classified into four types according to the combination of demand-control: high job strain, which combines high demand and low control; passive, low demand and low control; active, high demand and high control; and low job strain, low demand and high control. The effects of occupational stress can be moderated by the social support of peers and superiors. Thus, the worst condition is admittedly when work is highly demanding with low social support (Alves et al., 2004; Karasek, 1979; Karasek, Triantis, & Chaudhry, 1982).

Recently, Shukla and Srivastava (2016) developed a new version called the New Job Stress Scale, which included new scales based on theoretical models and questionnaires about work stress in several countries. The New Job Stress Scale contains 22 items based on different scales and items referring to the previous job stress scale, role expectation conflict, coworker support, and work-life balance. The items on the job stress scale are based on the short version questionnaire of the Job Stress Scale (Jamal & Baba, 2000); those of role expectation conflict, in the Occupational Stress Indicator (Cooper, Sloan, & Williams, 1988); those of coworker support, on the Social Support Scale (O'Driscoll, 2000); and those of work-life balance, on the Work-life Balance Scale (Brough, Timms, & Bauld, 2009). The development of the scale adopted the following procedures: (1) review of the Job Stress Scale; (2) collection of scales and items based on the literature review; (3) scales / items for the pilot study; (4) a pilot survey; and (5) reliability and validity of the New Job Stress Scale. Thus, this scale distinguishes stressors from previous studies, and adds new elements of a psychosocial nature from different questionnaires and theoretical bases. Organizational, technological, socioeconomic, and relationship changes are presumed to affect occupational stress experienced by workers (Shukla & Srivastava, 2016).

Thus, the objective of this article is to adapt into Portuguese the New Job Stress Scale by Shukla and Srivastava (2016), which measures a set of stressors related to the development of work. Therefore, this article is divided into four studies that aimed at the semantic translation and validation of the New Job Stress Scale into Portuguese (preliminary study), the identification of items according to the instrument's dimensions (Study 1), the evaluation of the original and adapted models (Study 2), and correlation between the scores of the New Job Stress Scale and the Job Stress Scale dimensions (Study 3). All participants voluntarily

agreed to participate in the research and signed the free and informed consent form, guaranteeing anonymity. This research was approved by the Research Ethics Committee of the Federal University of Paraíba.

Method

Preliminary Study

Participants. Semantic validation was performed with workers from a public higher education institution (HEI) located in a city in northeastern Brazil. The selection of workers considered the number of years of study as an indicator for understanding the items on the scale. It was hypothesized that if workers with fewer years of education could understand them, there would be a possibility of the same occurring with workers with more years of study. Thus, only the workers allocated to the maintenance and general services sectors participated, and only if they had elementary or high school education. The choice of the workplace for this and the following studies was made because of convenience due to accessibility and cost. In addition, as the purpose of the scale is to measure occupational stress regardless of the work performed, any worker can be considered eligible to compose the sample, and it is even recommended that the samples have different occupational characteristics.

An initial sample of 11 workers participated in this study, but two were excluded for not having answered the survey instrument completely. Most were female (77.8%), married or in a common-law marriage (55.6%), with children (55.6%), and had completed high school (77.8%). The average age was 33.44 (\pm 11.78) years old. In addition, they have 24.67 (\pm 17.97) months in their current role and perform a weekly workload of 44.67 (\pm 2.82) hours. Regarding the type of contract, it was observed that 88.9% were outsourced contractors and 11.1% were hired for a fixed period.

Instrument. The scale proposed by Shukla and Srivastava (2016) can measure potential job stressors, covering stressors job characteristics, organizational structure, climate and information flow, role, relationship, career development, external commitments and responsibilities, role conflict, coworker support, and work-life balance. Its original psychometric properties include: (1) Cronbach's alpha greater than .70 for most items, and .81 considering the general; (2) test-retest reliability given by Pearson's correlation and intraclass correlation coefficient greater than or equal to .50; and (3) most items without high correlation and only a few moderately correlated.

Data collection procedures and ethical considerations. To avoid external interference, the workers responded to the instrument individually and in a location outside the workplace. No minimum or maximum time limits were stipulated for the instrument to be answered. Subsequently, a meeting was held for each worker to point out possible difficulties that could compromise the understanding of the items.

Data analysis procedures. The adaptation of this scale to the Portuguese language followed the procedures described in the study by Alves et al. (2004), considering criteria of semantic, operational, measuring, and functional conceptual equivalence between items in both languages (English and Portuguese). These criteria ensure that concepts, meanings, emotional effects, formats, instructions, administration methods, measurement methods, and psychometric properties correspond between the two cultures and that the items are understandable in the Brazilian context. The process included the review of national and international literature, dictionary searches, translation, back translation, probing, pre-tests, and studies of reliability and internal consistency. Translators,

specialists in the field, and several workers from five Brazilian cities participated in this process.

Prior to the application of the instrument, the items were randomized in the Research Randomizer. For this, the instrument items in Portuguese were numbered from 1 to 22, and then items 1 to 18 (whose answer option is from 1 to 5, ranging from "totally disagree" to "totally agree") were randomized. The randomization results presented the following sequence: 17, 3, 7, 12, 9, 13, 11, 8, 4, 2, 15, 1, 10, 6, 18, 16, 5 and 14. Items 19 to 22 were not included in this process because they presented different response options, which range from 1 to 6 ("never" to "all the time"). The randomized items are part of three dimensions of the instrument ("work overload", "role expectation conflict" and "work-life balance"). As for the nonrandomized items, however, they belong to the "coworker support" dimension. These items were organized in two blocks according to the randomization results and the answer options so that they were to be answered by the interviewees, omitting the dimension categorization.

Results

The participants reported difficulties in item 3 of the "role expectation conflict" dimension, initially translated as "I cannot satisfy the demands of customers and of other people because they are different". These difficulties were related to problems in understanding and accepting the "customers" section, as it suggested that the instrument was limited to the service sector. Considering the suggestions of the workers and of two psychologists, this item was modified to "I cannot satisfy the demands of the people I serve and of other people because they are different".

The Portuguese version of the New Job Stress Scale was also named the "New Job Stress Scale". It is noteworthy that in the original version, there are three different scales with response options, arranged in four dimensions. The first two dimensions are composed of five response options; the third dimension has six options; and the fourth presents five options. The fourth dimension differs from the first two only at the third point of the scale (Table 1).

For the Portuguese version, two scales of response options were included, maintaining the four dimensions. However, the second and fourth dimensions encompassed the same response options due to the similarity of the neutral and undecided options, having, therefore, been adapted using the expression "neither agree nor disagree". Thus, in the Brazilian version, the dimension "work-life balance" was included as the third dimension and "coworker support" as the fourth dimension because of the arrangement of the scales with the response options. In addition, due to the nature of the items, the first dimension was called "work overload" (Table 1).

Study 1

Method.

Participants. A total of 263 workers from a public HEI (82.9%) and a private HEI (17.1%), located in two cities in northeastern Brazil. These workers performed technical, administrative, and teaching activities. Most had graduate degrees (45.2%), were female (65.5%), aged 41 years or older (38.8%), married (48.7%), and had children (53.2%). Regarding work, most workers (57%) have been in their current job for up to 5 years. The average weekly workload is 33.68 (\pm 7.90) hours.

Instrument and procedures. The translated and adapted Portuguese version of the New Job Stress Scale was used. To avoid

Table 1
Original version and Portuguese language adapted version of the New Job Stress Scale

New Job Stress Scale*	
Item	Job Stress Scale
1	I have a lot of work and fear that very little time to do it.
2	I feel so burdened that even a day without work seems bad.
3	I feel that I never take a leave.
4	Many people at my office are tired of the company demand.
5	My job makes me nervous.
6	The effect of my job on me is too high.
7	Many a times, my job becomes a big burden.
8	Sometimes when I think about my job I get a tight feeling in my chest.
9	I feel bad when I take a leave.
Role expectation conflict	
1	I'm not able to satisfy the different demands of various people above me.
2	I'm not able to satisfy the conflicting demands of my colleagues and juniors.
3	I'm not able to satisfy the demands of clients and others, because they are opposite to each other.
4	The expectations of my seniors are different from my juniors.
5	I am concerned about the different expectations of different people.
Answer options: (1) Strongly disagree; (2) Disagree; (3) Undecided; (4) Agree; (5) Strongly agree.	
Coworker support	
1	Have the people working with me ever given any information or advice to me?
2	Have the people working with me ever understand me and given advice?
3	Has anyone given me a clear and helpful feedback about my work?
4	Has anyone given me assistance in my work?
Answer options: (1) Never; (2) Very occasionally; (3) Sometimes; (4) Often; (5) Very often; (6) All the time	
Work-life balance	
1	I am able to balance between time at work and time at other activities.
2	I have difficulty balancing my work and other activities.
3	I feel that the job and other activities are currently balanced.
4	Overall, I believe that my work and other activities are balanced.
Answer options: (1) Strongly disagree; (2) Disagree; (3) Neutral; (4) Agree; (5) Strongly agree.	
Nova Escala de Estresse no Trabalho	
Item	Sobrecarga de trabalho
1	Eu tenho muito trabalho para fazer em pouco tempo.
2	Eu me sinto tão sobrecarregado(a) que mesmo quando tiro um dia de folga não consigo descansar.
3	Eu sinto que nunca posso tirar um dia de folga do trabalho.
4	Muitas pessoas no meu trabalho estão cansadas devido às exigências da empresa.
5	Meu trabalho me deixa nervoso(a).
6	Os efeitos do meu trabalho em mim são muito altos.
7	Muitas vezes meu trabalho me sobrecarrega.
8	Às vezes, quando eu penso no meu trabalho, sinto um aperto no peito.
9	Eu me sinto mal ao tirar uma folga do trabalho.
Conflito de expectativa de função	
1	Não consigo satisfazer as diferentes exigências dos meus chefes.
2	Não consigo satisfazer as diferentes exigências dos meus colegas de trabalho e dos novatos da empresa.

Table 1 (continued)
Original version and Portuguese language adapted version of the New Job Stress Scale

3	Não consigo satisfazer as exigências das pessoas que atendo e de outras pessoas porque elas são diferentes.
4	As expectativas dos meus colegas de trabalho mais antigos são diferentes das expectativas dos novatos.
5	Estou preocupado(a) com as diferentes expectativas das pessoas no meu trabalho.
Equilíbrio entre trabalho e vida pessoal	
1	Eu consigo equilibrar o tempo de trabalho com o tempo em outras atividades pessoais.
2	Tenho dificuldade em manter o equilíbrio entre meu trabalho e outras atividades pessoais.
3	Atualmente, eu sinto que há um equilíbrio entre meu trabalho e outras atividades pessoais.
4	Em geral, eu acredito que meu trabalho e outras atividades pessoais estão em equilíbrio.
Opções de resposta: (1) Discordo totalmente; (2) Discordo; (3) Nem concordo nem discordo; (4) Concordo; (5) Concordo totalmente.	
Suporte social no trabalho	
1	As pessoas que trabalham comigo sempre me dão alguma informação ou conselho?
2	As pessoas que trabalham comigo sempre me entendem e me dão conselho?
3	Alguém já me disse de forma clara e útil como eu tenho trabalhado?
4	Alguém já me ajudou no meu trabalho?
Opções de resposta: (1) Nunca; (2) Raramente; (3) Às vezes; (4) Frequentemente; (5) Muitas vezes; (6) O tempo todo.	

Note. Source: *Shukla and Srivastava (2016).

external interference, the workers responded to the instrument individually and in a location outside the workplace. No minimum or maximum time limits were stipulated for the instrument to be answered.

Statistical analysis. Data were analyzed using the R software, version 3.4.4 (R Core Team, 2018). A full-information exploratory factor analysis was performed using the “mirt” function of the “mirt” package, where the items were analyzed according to the instrument response options. In view of the prior knowledge of the original instrument dimensions, the criteria for retaining the item in the factor were specified, a priori, with three factors for items 1 to 18 and one factor for items 19 to 22. In addition, Cronbach's alpha and McDonald's omega estimators were used to assess reliability (Hair, Black, Babin, Anderson, & Tatham, 2009; Marôco, 2010).

The Oblimin rotation methods were employed. The Kaiser-Mayer-Olkin (KMO) test calculation was done using the “KMO” function; the Bartlett test was applied using the “cortest.bartlett” function; Cronbach's alpha was calculated using the “alpha” function; McDonald's omega was obtained using the “omega” function. The “KMO”, “cortest.bartlett”, “alpha” and omega functions are available in the “psych” package. The cut-off value for the KMO was .5 (Kaiser, 1974) and for the level of statistical significance of the Bartlett sphericity test, less than .05. For factor loadings the cut-off point was greater than .3 and for communalities, greater than .2 (Hair et al., 2009).

Results. The results of the KMO test and the Bartlett sphericity test indicated the adequacy of the sample for factor analysis. The KMO value for items 1 to 18 was .85 and, for items 19 to 22, it was .70. Bartlett's tests were also significant for items 1-18 ($\chi^2 = 537.109; p = .000$) and for items 19-22 ($\chi^2 = 136.270; p = .000$). Cronbach's alpha index values were .74 for items 1 to 18 and .75 for items 19 to 22; for McDonald's omega, it was .88 for items 1 to 18 and .80 for items 19 to 22.

Then, the dimensions of the instrument were analyzed

Table 2
Factor loadings and communality (h^2) of items according to dimensions

Dimension	Item	Factor loadings	h^2
Work overload	5. My job makes me nervous.	-.80	.64
	6. The effect of my job on me is too high.	-.77	.61
	2. I feel so burdened that even a day without work seems bad.	-.76	.63
	7. Many a times, my job becomes a big burden.	-.68	.45
	14. I am concerned about the different expectations of different people.	-.51	.49
	4. Many people at my office are tired of the company demand.	-.60	.47
	1. I have a lot of work and fear that very little time to do it.	-.61	.38
	8. Sometimes when I think about my job I get a tight feeling in my chest.	-.57	.35
Role expectation conflict	11. I'm not able to satisfy the conflicting demands of my colleagues and juniors.	-.94	.81
	10. I'm not able to satisfy the different demands of various people above me.	-.63	.75
	12. I'm not able to satisfy the demands of clients and others, because they are opposite to each other.	-.68	.54
Work-life balance	13. The expectations of my seniors are different from my juniors.	-.39	.19
	18. Overall, I believe that my work and other activities are balanced.	.88	.80
	17. I feel that the job and other activities are currently balanced.	.83	.67
	15. I am able to balance between time at work and time at other activities.	.76	.59
Coworker support	16. I have difficulty balancing my work and other activities.	-.46	.55
	20. Have the people working with me ever understand me and given advice?	.95	.90
	19. Have the people working with me ever given any information or advice to me?	.90	.82
	22. Has anyone given me assistance in my work?	.64	.40
	21. Has anyone given me a clear and helpful feedback about my work?	.42	.18

separately for items 1 to 18 and 19 to 22. In the first case, a three-dimensional structure was found. Only item 3 (“I feel that I never take a leave”) and item 9 (“I feel bad when I take a leave”) did not fit the dimensions. Additionally, item 14 (“I am concerned about the different expectations of different people”), which in the original instrument comprises the “role expectation conflict” dimension, was adjusted to the “work overload” dimension. In the second case, a one-dimensional structure was verified. Thus, most of the items in the translated and adapted into Portuguese version were similar to the original instrument dimensions, whose factor loadings and communalities are shown in Table 2.

Study 2

Method.

Participants. Two hundred workers from the shoe production sector in a factory located in a city in northeastern Brazil participated. These workers performed operational and organizational activities in production cells for sports shoes and safety boots. Most were male (61.5%), single (56%), and without children (52%). The average age was 28.84 (\pm 9.20) years old, with a predominance between 21 and 30 years old (45%). Most have completed high school (88.5%) and have been in their current job for up to 5 years (90.5%). Their workload is 46 hours per week.

Instrument and procedures. The translated and adapted into Portuguese version of the New Job Stress Scale was used. To avoid external interference, workers responded to the instrument individually and in a location outside the workplace. No minimum or maximum time limits were stipulated for the instrument to be answered. During the interviews, each operator was replaced by the production leader or by the backup (multifunctional workers trained to replace the leader in special situations), and in the case of interviews with the leaders, these were replaced by the production supervisor.

Statistical analysis. Data were analyzed using the R software, version 3.4.4 (R Core Team, 2018). A confirmatory factor analysis was performed using the diagonally weighted least squares (DWLS) method to estimate factor loadings through the “cfa”

function of the “lavaan” package. The DWLS method was selected because it is indicated for categorical variables and does not require an assumption of normality for the data (Gorenstein, Wang, & Hungerbühler, 2015). The objective was to observe the factorial validity of the model according to (1) the original English version and (2) the translated and adapted into Portuguese version. In the original version, the items were considered according to their dispositions in the four dimensions of the instrument. In the translated and adapted into Portuguese version, the arrangement of the items considered the results obtained in the three-dimensional and one-dimensional structure of the model from Study 1. Thus, for this version, items 3 and 9 of the “work overload” dimension were removed from the model. In addition, item 14 was removed from the “role expectation conflict” dimension and inserted in the “work overload” dimension. Consequently, the adapted model was composed of 20 items (Hair et al., 2009; Marôco, 2010). Cronbach’s alpha and McDonald’s omega estimators were used to assess reliability. The cut-off value for Cronbach’s alpha and McDonald’s omega was greater than or equal to .7, considering the value of McDonald’s omega greater than alphas’ value (Zinbarg, Revelle, Yovel, & Li, 2005).

In addition, adjustment indexes were used to verify evidence of factorial validity and accuracy for the original (with 22 items) and adapted (with 20 items) models. The probability of fitting the theoretical model to the data is tested by χ^2 (chi-square). However, the ratio between the chi-square and its degree of freedom (χ^2/gf) is more used, and in this study it was admitted χ^2/gf less than 5 (Aquino et al., 2015; Karadağ et al., 2015). The Comparative Fit Index (CFI) allows the comparison between the covariance matrix predicted by the model with the one observed; the Goodness of Fit Index (GFI) indicates the proportion of variance-covariance in the data explained by the model; and the Tucker Lewis index (TLI) is used to estimate the model’s discrepancies. Cut-off values greater than 90% were adopted for the CFI, GFI and TLI (Brown, 2015; Marôco, 2010; Marsh, Balla, & McDonald, 1988). For the Expected Cross-Validation Index (ECVI) the model with the lowest value is considered the most well-adjusted (Oliveira & Barbosa, 2018). Finally, for the Root Mean Square Error of

Approximation (RMSEA), which represents a standardized mean measure regarding model adjustment, the cut-off value was less than 5% (Heene, Hilbert, Draxler, Ziegler, & Bühner, 2011; Kelley & Lai, 2011).

Results. Cronbach's alpha index values were .70 for items 1 to 18 and .77 for items 19 to 22; for McDonald's omega, it was .85 for items 1 to 18 and .84 for items 19 to 22. Adjustment quality indexes (absolute, relative, populational discrepancy and based on information theory) were used considering a 95% confidence interval and $p < .05$. It was found that the adjustment indexes were slightly better in the adapted model with 20 items, according to Table 3. Factor loading, variance and significance of the items in the original (22 items) and adapted (20 items) models are found in Table 4. Plus, Table 5 presents the covariance matrix of both models' dimensions (Marôco, 2010).

Table 3
Adjustment indexes of the original and adapted models

Model	χ^2/df	CFI	GFI	TLI	ECVI	RMSEA (95% CI)
Original (22 items)	2.34	.94	.96	.93	2.39	.08 (.07-.09)
Adapted (20 items)	2.22	.95	.96	.94	1.96	.08 (.07-.09)

Note. χ^2/df = chi-square ratio for the degree of freedom; CFI = comparative fit index; GFI = goodness-of-fit index; TLI = Tucker-Lewis index; ECVI = expected cross-validation index; RMSEA = root-mean-square error of approximation; CI = confidence interval.

Table 4
Factor loadings, variance and significance of items in the original (22 items) and adapted (20 items) models

Items	Original model (22 items)			Adapted model (20 items)		
	Factor loading	Variance	p-value	Factor loading	Variance	p-value
1. I have a lot of work and fear that very little time to do it.	1.00	.65	-	1.00	.64	-
2. I feel so burdened that even a day without work seems bad.	1.22	.48	.00	1.21	.47	.00
3. I feel that I never take a leave.	.74	.81	.00	-	-	-
4. Many people at my office are tired of the company demand.	1.06	.61	.00	1.07	.59	.00
5. My job makes me nervous.	1.02	.63	.00	1.02	.63	.00
6. The effect of my job on me is too high.	1.10	.58	.00	1.08	.58	.00
7. Many a times, my job becomes a big burden.	.73	.81	.00	.70	.82	.00
8. Sometimes when I think about my job I get a tight feeling in my chest.	.79	.78	.00	.76	.79	.00
9. I feel bad when I take a leave.	.18	.99	.00	-	-	-
10. I'm not able to satisfy the different demands of various people above me.	1.00	.51	-	1.00	.40	-
11. I'm not able to satisfy the conflicting demands of my colleagues and juniors.	.62	.81	.00	.62	.77	.00
12. I'm not able to satisfy the demands of clients and others, because they are opposite to each other.	.82	.67	.00	.80	.62	.00
13. The expectations of my seniors are different from my juniors.	.65	.79	.00	.68	.73	.00
14. I am concerned about the different expectations of different people.	.81	.68	.00	.87	.73	.00
15. I am able to balance between time at work and time at other activities.	1.00	.70	-	1.00	.67	-
16. I have difficulty balancing my work and other activities.	-1.34	.45	.00	1.24	.50	.00
17. I feel that the job and other activities are currently balanced.	.89	.76	.00	.88	.75	.00
18. Overall, I believe that my work and other activities are balanced.	.97	.72	.00	.95	.70	.00
19. Have the people working with me ever given any information or advice to me?	1.00	.41	-	1.00	.41	-
20. Have the people working with me ever understand me and given advice?	1.13	.25	.00	1.13	.25	.00
21. Has anyone given me a clear and helpful feedback about my work?	.70	.71	.00	.70	.71	.00
22. Has anyone given me assistance in my work?	.86	.57	.00	.86	.57	.00

Table 5
Covariance matrix of the original (22 items) and adapted (20 items) models' dimensions

Dimension	WO	REC	WLB	CS
Original model (22 items)				
WO	.35	.35	-.22	-.09
REC	.35	.49	-.18	-.07
WLB	-.22	-.18	.31	.17
CS	-.09	-.07	.17	.59
Adapted model (20 items)				
WO	.36	.32	-.24	-.10
REC	.32	.60	-.17	-.08
WLB	-.24	-.17	.33	.18
CS	-.10	-.08	.18	.59

Note. WO = work overload; REC = role expectation conflict; WLB = work-life balance; CS = coworker support.

Study 3

Method.

Participants. Two hundred workers from the shoe production sector who worked in three factories located in three cities in northeastern Brazil. These workers performed operational and organizational activities in the production cells for sports shoes, safety boots, and rubber sandals. Most had completed high school (87.5%), were male (73.5%), married or in a common-law marriage

(53%), and had children (56%). The average age was 30.31 (\pm 8.99) years old, with a predominance between 21 and 30 years (47%) old. Regarding work, the majority (57%) have been in their current job for up to 5 years. Their workload is 46 hours per week.

Instruments and procedures. The translated and adapted into Portuguese version of the New Job Stress Scale and the short of the Job Stress Scale Portuguese version were used. The Job Stress Scale comprises 17 items to be answered on four-point scales. Eleven items relate to the demand and control, the answer to which varies from “frequently” to “never or almost never”. The remaining six items refer to social support, with response options ranging from “strongly agree” to “strongly disagree”. This instrument assesses occupational stress by means of demand, control and social support scores, using the latter as a moderator of the negative effects on workers’ health. The original psychometric properties of this scale include test-retest reliability with reproducibility estimates of .88, .87, and .85, and internal consistency of .79, .67, and .85 for demand, control and social support, in that order (Alves et al., 2004).

To avoid external interference, workers responded to the instrument individually and in a location outside the workplace. No minimum or maximum time limits were stipulated for the instrument to be answered. During the interviews, each operator was replaced by the production leader or by the backup (multifunctional workers trained to replace the leader in special situations), and in the case of interviews with the leaders, these were replaced by the production supervisor.

Statistical analysis. Data were analyzed using the R software, version 3.4.4 (R Core Team, 2018). Initially, the data were adjusted for items in which the response score had a reverse direction. For the New Job Stress Scale, this was verified by the values of the factor loadings. For the Job Stress Scale, this was assessed based on the document “On the use of the reduced and adapted scale on stress at work”, obtained through personal communication with Alves (personal communication, May 3, 2018). Then, the scores for the dimensions of each instrument were calculated: (1) “work overload”, “role expectations conflict”, “work-life balance” and “coworker support” for the New Job Stress Scale; and (2) “demand and control” and “social support” for the Job Stress Scale. The scores were obtained using the regression method. Subsequently, a correlation matrix was built, aiming to analyze the strength and direction of the scores of both instruments’ dimensions (Table 6). In addition, Cronbach’s alpha and McDonald’s omega estimators were used to assess reliability. Associations between the instruments’ dimensions were considered evidence of convergent validity, demonstrating that both intend to measure the same construct, i.e., occupational stress (Aquino et al., 2015; Hair et al., 2009; Marôco, 2010).

Results

In this study, for the New Job Stress Scale, Cronbach’s alpha index values were .75 for items 1 to 18 and .77 for items 19 to 22; for McDonald’s omega, it was .85 for items 1 to 18 and .81 for items 19 to 22. For the Job Stress Scale, Cronbach’s alpha index values were .52 considering demand and control, and .75 for social support. Additionally, the following adjustment indexes were observed: $\chi^2/g^2 = 1.36$; CFI = .95; GFI = .95; TLI = .96; ECVI = 1.34; RMSEA (95% CI) = .04 (.03-.06). Although they were from weak to moderate, the results showed direct and inverse correlations between the dimensions of the two instruments (Table 6).

Table 6

Correlation matrix of instrument scores according to dimensions

New Job Stress Scale	Job Stress Scale	
	Demand and control	Social support
Work overload	-.37*	.36*
Role expectation conflict	-.31*	.30*
Work-life balance	.31*	-.38*
Coworker support	.18*	-.41*

Note. * $p \leq .01$.

Discussion

Occupational stress occurs when demands exceed the available mental, physical, and material resources. The stress situation is characterized by an adverse work condition that can generate negative and clinically relevant repercussions (Greiner, 2008), decrease worker performance, and generate social costs (Khajuria & Nayak, 2018). This means that occupational stress affects both workers and organizations.

In recent decades, stress has increased in the workplace, and it is still a challenge to build measures towards reducing and controlling the risk factors involved. Assessing the causes of occupational stress is important for directing actions and reducing direct and indirect costs. The results of this assessment can be used to improve health surveillance and develop specific management and intervention strategies (Marcatto et al., 2016). Understanding the different levels of stress makes it possible to prevent health problems related to inadequate work and establish organizational policies for managing demands and resources (Khajuria & Nayak, 2018).

Due to the multifactorial nature of the stressor agents, there are several theoretical models for ascertaining the elements related to occupational stress. The complexity lies in the fact that the analysis must consider subjective aspects, which goes beyond the physical-chemical measurements of classical biomedical research. These models must be able to encompass different types of occupations (St-Hilaire & Gilbert, 2019) and serve as support for the construction of instruments that investigate their causative agents.

In general, occupational stress scales are based on the theoretical model of demand and control proposed by Karasek (1979), and since the 1980s, there has been a tendency to consider the moderating effect of social support at work (Karasek et al., 1982; Kokoroko & Sanda, 2019; Van der Doef & Maes, 1999). This model suggests that a work environment with stressful demands, control restrictions and lack of resources to establish adequate coping strategies exposes the worker to occupational stress due to the tension generated by the feeling of imbalance (St-Hilaire & Gilbert, 2019). The results have practical implications that can be applied in the workplace (Kain & Jex, 2010). In addition to addressing these items, the New Job Stress Scale specifically adds a dimension that addresses the balance between arising demands from work and non-professional activities.

In Brazil, some scales have been suggested for the assessment of occupational stress. These scales have emphasized the demand and job control, social support (Alves et al., 2004), organizational stressors, and psychological reactions (Paschoal & Tamayo, 2004). Recently, Ferreira et al. (2015) developed a scale based on the studies by Cooper et al. (2001), involving conflict and ambiguity of roles; work overload; lack of social support; career insecurity; lack of autonomy; work-family conflict; and the pressure stemmed from the degree of responsibility. However, this study did not adopt criteria to verify the predictive validity of the scale.

In Study 1, it was observed that two of the 18 items evaluated

(items 3 and 9) did not fit the dimensions, which provides evidence that these items are not adequate for the Brazilian workplace. These items refer to the feeling of never being able to take a day off from work and feeling bad when taking time off. As the type of stressor (Guest, 2002) and the views on work can vary according to culture or country (Hsieh & Lin, 2010), the items may not be appropriate for a given context. This identification allows a better direction regarding the management of organizational actions (Khajuria & Nayak, 2018).

Still in Study 1, it was found that item 14 was adjusted to a different dimension from the original instrument. This item addresses the worker's concern about the different expectations of people at work. In the original instrument, this item integrates the dimension that addresses "role expectation conflict", and in this study, it was adjusted to "work overload". It is possible that different expectations about the worker result in greater pressure regarding the expected results (Singh & Sharma, 2017). As an answer, the worker can increase the rhythm of work, that is, the speed with which he or she performs technical actions to accomplish what is expected (Greiner, 2008), or feel so pressured that he or she feels unable to meet these expectations (Singh & Sharma, 2017). The organism understands the situation as an overload threat and, therefore, as a negative assessment of occupational stress (Marcatto et al., 2016).

In Study 1, the factor loadings and the communality of the items of the translated and adapted into Portuguese instrument were also observed. The factor loading refers to the correlation between the original variables and the factors; in general, assuming a minimum correlation of .3. The communality, on the other hand, analyzes the level of explanatory acceptability of the variables. Thus, factor loading indicates how correlated the item is in its respective dimension of the instrument, while communality indicates the total amount of variance that an item shares with all other items included in the independent analysis of the dimension. There is no consensus on the minimum acceptability value of the communality index, but it is known that higher values indicate a greater amount of variance. That is, items with higher values of factor loading and communality better explain occupational stress (Hair et al., 2009).

In Study 2, the absolute and relative adjustment indexes showed that the adapted model (20 items) presents a better quality of the model per se, values closer to the reference, and better values in a comparative analysis between the models (original and adapted). In this study, χ^2/df was less than 5, which indicates acceptability of the model. The values of the GFI and TLI indexes indicated a very good adjustment, and CIF and RMSEA indicated a good adjustment. Despite not presenting reference values for the classification of the model's adjustment, ECVI can be used in comparative terms, where the best model will be the one with the lowest value in this index. In this study, the adapted model (20 items) showed lower value for this index (Marôco, 2010).

Study 3, on the other hand, made it possible to ascertain that the dimensions of the New Job Stress Scale are significantly correlated with those of the Job Stress Scale, suggesting that the results are not independent, i.e., that the dimensions share aspects in common. However, these correlations varied from weak to moderate (Hair et al., 2009), which provides evidence that many of these aspects are not equally contemplated in both instruments. In fact, items related to role expectation conflict and work-life balance included in the New Job Stress Scale are not included in the Job Stress Scale.

In the Job Stress Scale version, role expectation conflict is represented only in the item "Does your job usually have contradictory or disagreeable requirements?", which integrates

the "demand and control" dimension. The New Job Stress Scale presents a specific dimension on the topic, which addresses the worker's ability to meet the expectations and requirements of colleagues (seniors and juniors), superiors or other people. For Sutton, Family, Scott, Gage and Taylor (2016), assessing the existence of a role expectation conflict is important since these situations affect the sense of direction at work, make it difficult to recognize problems, and cause ambiguities as to individual and work collectives' responsibilities.

Additionally, the New Job Stress Scale presents a dimension that is not included in the Job Stress Scale regarding the perception of the balance between a set of factors inside and outside work (Guest, 2002) in terms of time spent and a general assessment (Shukla & Srivastava, 2016). Work demands are believed to reduce the amount and quality of time available for non-professional activities. It represents a matter of contemporary interest because the increase in technology has reduced the boundaries between home and work environments, resulting in a perception of additional work (Guest, 2002; Harris, Lambert, & Harris, 2013) with effects on the health and performance of workers, families and organizations (Kalliath & Brough, 2008). The conflict is based on how working time influences the time dedicated to the fulfillment and performance of family responsibilities (Netemeyer, Boles, & McMurrian, 1996). Furthermore, the study of work-life balance reveals indirectly related issues such as the persistence of tense reactions even when the worker is not directly exposed to the stressor agent (Sonnentag & Fritz, 2015) and gender inequalities in and out of work (Martínez-Tola, de la Cal, Larrañaga, & Jubeto, 2019).

Another aspect observed refers to the inverse correlations between dimensions with similar concepts. This can be seen between "coworker support" and "social support". One can assume that it is related to the fact that in the New Job Stress Scale, all four items that form this dimension are addressed in an active way, that is, at some point in the development of the work, there was actually an intervention or feedback given by someone. In the Job Stress Scale, only two of the six items that this dimension comprises refer to any type of intervention or feedback. However, these are approached on a hypothetical basis and only mention peers represented by coworkers. That is, while in the first instrument, this support is or has been actively given, in the second instrument, this statement is hypothetical. This type of approach can interfere with occupational stress by moderating its effects when there is a perception of real support.

Collectivist work environments provide more active and cooperative behaviors. Support from peers and hierarchy has a moderating effect on the negative effects of occupational stress and seems to influence work performance under tense conditions (Kim et al., 2017). In fact, social support can mitigate the impacts of labor demands (Pedersen, Halvari, & Olafsen, 2018), promote engagement (Ahmed et al., 2019), and reduce presenteeism (Yang et al., 2019). Additionally, when this support network extends beyond the work environment, it can generate a strengthening of interpersonal relationships at work (Leiva, Poilpot-Rocaboy, & St-Onge, 2018).

This study presents some limitations. Although it involves the participation of workers from five Brazilian cities, these are limited to companies and institutions located in northeastern Brazil. A second limitation refers to the cross-sectional design, as the data were collected in a single moment. This means that the importance of the items may vary according to the socioeconomic and cultural circumstances at the time they were collected. It is recommended that future studies add evidence of validity in other occupational contexts as well as in other Brazilian regions.

The main objective of this study was to translate and adapt the New Job Stress Scale into the Portuguese language (Shukla & Srivastava, 2016), considering its convergence and precision with the short version of the Job Stress Scale adapted into the Portuguese language (Alves et al., 2004). The evidence suggests that, for the Brazilian reality, a structure consisting of 20 items distributed in four dimensions (“work overload”, “role expectation conflict”, “work-life balance” and “coworker support”) is very similar to the original instrument. Both the New Job Stress Scale and the Job Stress Scale seem to measure the same construct: occupational stress. However, weak to moderate correlations between the dimensions indicate divergences in the approach between these scales. In fact, the New Job Stress Scale presents items that are not evaluated on the Job Stress Scale and that, in the current context, constitute emerging elements from the negative effects of occupational stress.

This study provides methodological contributions and current practices for stress management in the workplace by developing a reliable factorial structure capable of measuring stress in workers of different occupations. Although occupational stress has a worldwide occurrence, risk factors may differ due to the cultural and organizational specificities of each society, justifying validation studies (Chang et al., 2005). The New Job Stress Scale (Shukla & Srivastava, 2016) was designed to assess occupational stress in Indian workers. In fact, the validation process for the Portuguese language pointed out some differences in the significance and arrangement of the items in the dimensions established in this study. As the scale identifies which items are most related to stress, it is possible to establish prevention and health surveillance strategies in addition to interventions that are more specific to the workers’ reality. This has relevant implications, since occupational stress contributes to the development of chronic illnesses, unsafe behaviors and incapacity for work (Chang et al., 2005; Wu et al., 2018).

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Information about the authors:

Wilza Karla dos Santos Leite

Universidade Federal da Paraíba, Campus I.
Programa de Pós-Graduação em Psicologia Social.
58051-900 Cidade Universitária, João Pessoa, Paraíba, Brasil.
E-mail: wilzakarlas@yahoo.com.br

Anísio José da Silva Araújo

E-mail: anisiojsa@uol.com.br

Luiz Bueno da Silva

E-mail: bueno@ct.ufpb.br

Erivaldo Lopes de Souza

E-mail: elopesouza@gmail.com

Carlos Eduardo Pimentel

E-mail: kdu1976@gmail.com

Jonhatan Magno Norte da Silva

E-mail: jonhatan.silva@delmiro.ufal.br

Natália Lins Pequeno de Assis

E-mail: natalia.lins.p@gmail.com

Emellyne Lima de Medeiros Dias Lemos

E-mail: emellyne@gmail.com

Pierre Gonçalves de Oliveira Filho

E-mail: pierre_subjetividade@yahoo.com.br