



Revista Brasileira de Saúde Ocupacional

ISSN: 0303-7657

ISSN: 2317-6369

Fundação Jorge Duprat Figueiredo de Segurança e  
Medicina do Trabalho - FUNDACENTRO

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Adaptação transcultural e validação da escala “indicadora de trabalho-vida” (work-life indicator) para uso no Brasil: Estudo Longitudinal de Saúde do Adulto (ELSA-Brasil)

Revista Brasileira de Saúde Ocupacional, vol. 48, 2023, pp. 1-11

Fundação Jorge Duprat Figueiredo de Segurança e Medicina do Trabalho - FUNDACENTRO

DOI: <https://doi.org/10.1590/2317-6369/17522pt2023v48edepi3>

Available in: <https://www.redalyc.org/articulo.oa?id=100575190005>

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This study is part part of Jéssica de Almeida Fernandes' master's thesis, "*Adaptação transcultural para o português da work-life indicator scale aplicada no ELSA-Brasil*," submitted in 2022 for the Postgraduate Program in Public Health Epidemiology of the Escola Nacional de Saúde Pública, Fundação Oswaldo Cruz.

The authors declare that this study was funded by Brazil's National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico, CNPq) (Processes 405551/2015-0 BA, 405544/2015-4 RJ, 405552/2015-7 MG, 405543/2015-8 ES, 405547/2015-3 SP and 405545/2015-0 RS). Griep RH, Rotenberg L and Fonseca MJM hold CNPq productivity scholarships. Griep RH and Fonseca MJM have been named Scientists of our State by the Rio de Janeiro State Research Support Foundation (Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro, FAPERJ). This study was partly funded by the FAPERJ, (Process SEI-260003/000247/2023).

The authors declare that this study has not been presented at any scientific event.

## Transcultural adaptation and validation of the work-life indicator scale for use in Brazil: Longitudinal Study of Adult Health (ELSA-Brasil)

*Adaptação transcultural e validação da escala "indicadora de trabalho-vida" (work-life indicator) para uso no Brasil: Estudo Longitudinal de Saúde do Adulto (ELSA-Brasil)*

### Abstract

**Objective:** to describe the stages in the transcultural adaptation and dimensional validation of the "life-work indicator" scale for use in Brazil. **Methods:** equivalence analyses regarding concept, items, and semantics were conducted by researchers experienced in using scales and/or occupational health. The scale was applied to the third wave of the Longitudinal Study of Adult Health (*Estudo Longitudinal de Saúde do Adulto*, ELSA-Brasil). Measurement equivalence was then assessed using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). **Results:** applied to 7,277 participants (50.3% of them male), the scale displayed equivalences regarding concept, items, and semantics proper to the Brazilian context, as well as appropriate correspondences in referential/denotative meaning of terms and overall/connotative meaning of items. EFA and CFA corroborated its theoretical structure in three dimensions – i) personal life invading work, ii) work invading personal life, and iii) perceived boundary control – returning suitable fit indices after exclusion of two items from the first dimension. CFA returned comparative fit index of 0.968, Tucker-Lewis index of 0.957, and root mean square error of approximation of 0.039 (90%CI: 0.035;0.041). **Conclusion:** the scale shows to be promising for assessing the management of boundaries between work and personal life in the Brazilian context, and will facilitate studies on the influence of such management on workers' health and wellbeing.

**Keywords:** psychometrics; work-life balance; psychosocial factors; occupational health

### Resumo

**Objetivo:** descrever etapas de adaptação transcultural e validade dimensional para uso, no Brasil, da escala "indicadora de trabalho-vida" (work-life indicator). **Métodos:** realizaram-se análises das equivalências conceitual, de itens e da semântica, conduzidas por pesquisadores experientes em uso de escalas e/ou saúde ocupacional. A escala foi aplicada a participantes da terceira onda do Estudo Longitudinal de Saúde do Adulto (ELSA-Brasil). Procedeu-se, então, a avaliação da equivalência de mensuração, utilizando-se Análises Fatoriais Exploratória (AFE) e Confirmatória (AFC). Resultados: aplicada a 7.277 participantes (50,3% do sexo masculino), a escala apresentou equivalências conceitual, de itens e semântica pertinentes no contexto brasileiro, bem como adequada correspondência de significado referencial/denotativa de termos e geral/conotativa dos itens. As AFE e AFC corroboraram a estrutura teórica de três dimensões – i) vida pessoal invadindo trabalho, ii) trabalho invadindo vida pessoal e iii) controle de limites percebidos –, com indicadores de ajuste adequados após a exclusão de dois itens da primeira dimensão. Na AFC, obteve-se índice de ajuste comparativo=0,968, índice de Tucker-Lewis=0,957 e raiz do erro quadrático médio de aproximação=0,039 (IC90%: 0,035;0,041). Conclusão: a escala é promissora para avaliar o gerenciamento de limites entre trabalho e vida pessoal no contexto brasileiro, assim como facilitará a realização de estudos sobre a influência desse gerenciamento na saúde e bem-estar dos(as) trabalhadores(as).

**Palavras-chave:** psicométrica; equilíbrio trabalho-vida; fatores psicossociais; saúde do trabalhador.

## Introduction

Over recent years, society has changed as a result of shifts in labor relations and family composition, especially as regards women's increasing participation in the paid labor market. Women, however, still bear greater responsibility for housework, to which they devote twice as many hours as men<sup>1-3</sup>. In addition, other kinds of family composition, such as single parenting and dual-income couples, have added to the experienced changes<sup>1-3</sup>. Meanwhile, in some fields, technological advances have lowered the boundaries between work and personal life, making it possible to work physically anywhere and at flexible hours<sup>4</sup>. When combined, these data point to a demand for studies on the work-housework interface as a source of conflicts.

Considering these changes, some individuals find themselves in situations where they need to manage their different roles – personal and work – and control the extent to which the functions of one overruns the space of the other. That boundary control can be defined as the degree to which individuals manage between these two roles<sup>5</sup>.

Mismanagement of these boundaries is associated, directly or indirectly, with health problems, depending on individual perceptions and conditions of life<sup>6</sup>. Studies have shown, for instance, that a preference for strongly segregated roles, together with day-to-day conditions in which work roles interfere strongly in personal life (and vice-versa), can lead to stress<sup>7</sup>. The lack of boundaries between work roles and private life can also be directly connected with burnout<sup>8</sup>. Along the same lines, a qualitative study<sup>9</sup> of 29 public school teachers in São Paulo demonstrated that work invading private life was one factor that helped explain the group's recurring episodes of illness.

From another standpoint, some authors argue for the indirect route, in which greater flexibility in time and place impacts health. These authors<sup>8</sup> point out that excessively long working days, extending beyond the agreed work hours, consequently invading private life, interfere with biological and social rhythms of sleep, recovery, and social interaction, and thus impair one's health and wellbeing.

Although the absence of boundaries between personal life and work has been studied from various different approaches, showing the effects on workers' health, most Brazilian and international studies have approached the issue from the standpoint of organizational psychology<sup>7,10,11</sup> and impact on the workforce<sup>12-14</sup>. In Brazil, the issue is also being

explored mainly by studies in the organizational and people management fields<sup>15-17</sup>. When studied in the health field, the methodological approach is most often qualitative<sup>9</sup>.

On the other hand, Brazilian studies<sup>18,19</sup> have addressed family-work conflict, involving the effort required to meet the demands of work and their interference in the ability to respond to the demands of family life (or vice-versa), as well as their relation to health outcomes. Although these are related concepts, the studies on family-work conflict have been limited to clashes between the roles of these two spheres and they do not entail the management of boundaries between work and personal life. As far as our study could determine, no Brazilian studies were found to use any instrument to measure the behavior of permeability between work and personal life roles.

The perception of boundary control and functional cross-interruption behavior (personal life interrupting work and vice-versa) are latent characteristics and thus cannot be measured objectively, they have to be assessed by way of other observable variables<sup>20</sup>. For this purpose, a work-life indicator scale<sup>21</sup> was proposed to measure functional cross-interferences between work and non-work, and perceived boundary control between the two functions. The scale elicits Likert-type responses ranging from 1 (agree completely) to 5 (disagree completely). It comprises 17 items in five different dimensions: i. aspects of personal life invading work (PLW), containing five items; ii. aspects of work invading personal life (WPL), with five items; iii. perceived boundary control (BC), three items; iv. identification with work (IW), two items; and v. identification with family (IF), two items.

Since it was first proposed, the instrument has been applied in several countries, but mostly in the United States<sup>10,12,22-26</sup>, where it originated, and in studies in Europe<sup>7,11,14,27-31</sup>. The studies encountered here were directed, among other things, to measuring scores in each dimension and evaluating the relationship between the final score and other phenomena, such as work-family conflict<sup>11,22</sup>. Another goal was to ascertain how the absence of boundaries was related to job satisfaction and performance<sup>12</sup>. In all the studies found, the final score from the scale was calculated as the mean of the responses in each specific dimension and there were no cut-off points<sup>7,10,11,21-23</sup>.

Authors also diverged in the use of the proposed dimensions: some<sup>12,26,28,30</sup> used all the dimensions and a management profile based on cluster analysis of the population or the cluster categories proposed by

Kossek (2012). Others<sup>23,24</sup>, used all the dimensions but analysed each separately, by mean scores. Lastly, several authors<sup>7,10,11,31,32</sup> used one or two dimensions of the scale, also evaluating by the mean scores in each of them.

Meanwhile, few studies have featured psychometric assessment of the scale<sup>7,10-12,22,25,29,31,32</sup> by internal consistency assessment (Cronbach's alpha). One single study by the scale's authors<sup>21</sup> offered a comprehensive psychometric analysis, which found that the indicators were appropriate after the original scale was reduced from 23 to 17 items in five dimensions (root mean square error of approximation, RMSEA=0.07; comparative fit index, CFI=0.95).

Keeping these aspects in mind, the three dimensions of the scale<sup>21</sup>, which addresses interferences, cross functions of work and personal life, and the control of these interferences between the two functions, were adapted to Brazilian Portuguese and applied to workers who participated in the third assessment (Wave 3) of the Longitudinal Study of Adult Health (*Estudo Longitudinal de Saúde do Adulto* – ELSA-Brasil). With this scale, it is possible to profile integration and segregation of work and personal life, as well as how such management may affect workers' behavior and health. This article describes the stages in the transcultural adaptation and dimensional validity assessment of the work-life indicator scale for use in studies regarding associations with health outcomes in the Brazilian context.

## Methods

### Study design

The cross-sectional methodological design of this study comprised distinct stages. The first was a transcultural adaptation of the original English language version of the instrument. The scale was then applied in an epidemiological study to ascertain the psychometric properties of the proposed Brazilian version.

### Participants

The scale was applied to active workers who participated in the third evaluation (Wave 3) of ELSA-Brasil. ELSA-Brasil, which began in 2008, is a multicenter, longitudinal cohort, of which the baseline (2008-2010) sample consisted of 15,105 civil servants of both sexes, aged 35 to 74 years, from six teaching and research centers in Brazil's Northeast, Southeast, and

South regions<sup>33</sup>. After the baseline, a further two data collection visits were conducted: from 2012 to 2014 (Wave 2); and 2017 to 2019 (Wave 3). Of those participants, 7,528 workers were eligible for application of the scale.

### Data collection

The work-life indicator scale was applied during in-person interviews of participants who had either not retired or had retired but were still working. The scale used in the study contained 13 items distributed in three dimensions<sup>5,21</sup>: i. Aspects of personal life invading work (PLW, five items); ii. Aspects of work invading personal life (WPL, five items); and iii. Perceived boundary control (BC, three items). The items offered five response categories, on a Likert-type scale, ranging from "completely agree" (1) to "completely disagree" (5). Taken together, the three dimensions make it possible to profile integration and segregation between work and personal life, as well as characteristics of the management of those profiles.

### Conceptual, item and semantic equivalences

Once authorized by the author of the scale, the study proceeded to the transcultural adaptation stages, which drew on recommendations in the literature<sup>34</sup>. Conceptual and item equivalences were assessed at the same time by a group of four researchers with prior experience in using scales and/or with occupational health. This process involved a literature review on construct theory, use of scales, prior evaluation of items' psychometric performance and their ability to cover the dimensions described, and relevance to the Brazilian context.

Semantic equivalence was assessed in three stages: i. translating the original instrument in English to Brazilian Portuguese, which was done by two experienced researchers fluent in English and working independently. They used a standardized form to attribute scores from 0 to 10 to the difficulty encountered in translating the items, headings, and response categories. The two translations led to a consensual version produced in Portuguese by the team of researchers mentioned above with the translators present; ii. the consensual Portuguese language version was then back-translated by a native English-speaking translator, with no access to the original version of the scale, who recorded comments and evaluated the difficulty in back-translating with scores from 0 to 10; iii. the original version of the scale was compared with the version resulting from the back-translation. This stage included

assessing semantic equivalence between the original and back-translated versions as regards referential (denotative) meaning and overall (connotative) meaning, with a view to ensuring that the meaning of the words was conveyed in both languages. The two (original and back-translated) versions were then sent to the scale's original author, for her to assess whether the original meaning had been preserved during the process, after which the version for the Brazilian context was approved.

After evaluating the need for adjustments and adaptation to the Brazilian context, further corrected versions of the instrument were prepared for pretesting (applied to 50 volunteers) and a pilot study (applied to 18 volunteers with characteristics similar to those of the study population. Pretesting evaluated the clarity of the questions and the difficulties in understanding the items, while the pilot study assessed the suitability of the instrument in its final form, regarding the content, drafting, arrangement of the items, and presentation.

### Data analysis

After obtaining the final version of the scale and applying it to the sample of active workers from Wave 3 of ELSA-Brasil, the next stages were to evaluate the scale's dimensional validity by means of the procedures of exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). First, it was decided to reverse score all the statements of the scale, with respect to the original version, meaning that the individuals who responded that they disagreed completely scored 1 (the minimum) and those who agreed completely scored 5 (the maximum). This was necessary in order to allow more direct interpretation comparable with other studies that used the scale. The exception was the statement *"Para manter o foco, eu não penso na minha família, amigos ou interesses pessoais enquanto trabalho"* – [In order to maintain focus, I do not think about my family, friends or personal interests while I work / (original) I do not think about my family, friends, or personal interests while working so I can focus] – which was maintained, because the meaning of the sentence is reversed when compared with the other items. Accordingly, for all items in the instrument, higher scores indicated greater adhesion to the dimension being evaluated and lower scores indicated lesser adhesion.

EFA was carried out to the criterion of factor loads greater than 0.40 and fit indices set as Tucker-Lewis (TLI) > 0.90 and RMSEA < 0.06<sup>35</sup>. Parallel factor analysis was used with eigenvalue > 1

in order to ascertain the number of principal components estimated for data fit.

Lastly, CFA was conducted with the data obtained by applying the work-life indicator scale, starting with the complete model of three dimensions and 13 items. For the second model, items with factor loading of < 0.50 were removed<sup>35</sup>. For the indices of fit pre-set as parameters, the values considered acceptable were CFI and TLI > 0.90 and RMSEA < 0.10<sup>35</sup>. The weighted least squares means and variance adjusted (WLSMV) estimator was used in the analysis. This estimator stands out as the most robust for large samples and is more suitable for ordinal categorical indicators<sup>36</sup>.

CFA was performed according to the theoretical model for item distribution in the three dimensions, which was also corroborated in the original version of the scale. Then the habitual metric components (indicators of fit, factor loadings, and respective residuals) were evaluated. Additionally, the internal consistency (by composite reliability indicator and Cronbach's alpha with a minimum acceptable value of 0.60)<sup>35</sup>, modification indices and convergent and discriminant factor validity by means of average variance extracted (AVE), and correlations between dimensions were also evaluated.

Convergent factor validity was evaluated by item loading (which had to be  $\geq 0.50$ ) and AVE (with a minimum acceptable value of 0.50 for each dimension)<sup>35,36</sup>. The recommended values for this latter indicator are > 0.70, while values > 0.60 are acceptable if other indicator values are acceptable<sup>35,36</sup>. Discriminant factor reliability was assessed by comparing the square of the value of the correlations between dimensions (shared variance) and the AVE. Discriminant variance was considered to exist when AVE was greater than shared variance<sup>35</sup>.

As a complement, the matrix of residual correlations between the items was also analysed. These values constitute an estimate of how distant the observed residuals are from zero residual, that is, perfect fit. Values between -2 and 2 were considered normal, that is, indicating the model was neither under- nor over-estimated<sup>37</sup>.

R software was used in all analyses<sup>38</sup>.

### Ethical considerations

ELSA-Brasil was approved by the research ethics committees of each of the institutions involved, on 27 January 2017, under Opinions No. 1.900.315, CAAE: 56021516.0.1001.5240, and all participants signed a free and informed declaration of consent.

## Results

The literature review on the subject and the discussions between the researchers involved at that stage showed equivalence in concept and items and, accordingly, relevance in applying the empirical manifestations of the dimension components to Brazilian culture, thus encouraging the subsequent adaptation stages. Most of the scale items were considered to offer little difficulty in translation, and evaluations ranged from 0 to 1. For the Brazilian version of the scale, the expression “work-life indicator scale” was translated as “*escala indicadora de trabalho-vida*.” Two items of the

control sub-dimension – “*I control whether I am able*” and “*I control whether I have clear boundaries*” – were adapted from their literal translations, in the endeavor to avoid expressions rarely used in the Brazilian context and to make it clearer what was being evaluated. These changes were agreed with the author of the original scale, who evaluated the comparisons between the original version in English and the version back-translated into English after the adaptations. Their appropriateness was also corroborated in further rounds of pretesting. The original version of the scale is shown in **Chart 1**, together with the final version in Brazilian Portuguese.

**Chart 1** Versions of the work-life indicator scale in United States English and Brazilian Portuguese

<i>Dimension</i>	<i>Original item</i>	<i>Item adapted by ELSA-Brasil</i>
Personal life invading work (PLW)	$a_1$ I take care of personal or family needs during work.	$a_1$ Eu cuido de questões pessoais ou familiares durante o trabalho.
	$a_2$ I respond to personal communications (e.g., emails, texts, and phone calls) during work.	$a_2$ Eu respondo a comunicações pessoais (ex.: e-mails, textos/SMS, aplicativos e chamadas telefônicas) durante o trabalho.
	$a_3$ I do not think about my family, friends, or personal interests while working so I can focus.	$a_3$ Para manter o foco, eu não penso na minha família, amigos ou interesses pessoais enquanto trabalho.
	$a_4$ When I work from home, I handle personal or family responsibilities during work.	$a_4$ Quando eu trabalho em casa, lido com responsabilidades pessoais ou familiares durante o trabalho.
	$a_5$ I monitor personal-related communications (e.g., emails, texts, and phone calls) when I am working.	$a_5$ Eu fico atento (a) em comunicações pessoais (ex.: e-mails, textos/SMS e chamadas telefônicas) quando estou trabalhando.
Work invading personal life (WPL)	$b_1$ I regularly bring work home.	$b_1$ Eu levo trabalho para casa regularmente.
	$b_2$ I respond to work-related communications (e.g., emails, texts, and phone calls) during my personal time away from work.	$b_2$ Eu respondo a comunicações ligadas ao trabalho (p. ex. e-mails, textos/SMS e chamadas telefônicas) no meu tempo livre fora do trabalho.
	$b_3$ I work during my vacations.	$b_3$ Eu trabalho durante as férias.
	$b_4$ I allow work to interrupt me when I spend time with my family or friends.	$b_4$ Eu deixo o trabalho interromper meus momentos com a família e amigos.
	$b_5$ I usually bring work materials with me when I attend personal or family activities.	$b_5$ Eu costumo levar materiais de trabalho quando participo de atividades pessoais ou familiares.
Perceived boundary control (BC)	$c_1$ I control whether I am able to keep my work and personal life separate.	$c_1$ Eu tenho condições de separar os assuntos de trabalho dos assuntos pessoais.
	$c_2$ I control whether I have clear boundaries between my work and personal life.	$c_2$ Eu tenho condições de estabelecer limites bem claros entre o trabalho e minha vida pessoal.
	$c_3$ I control whether I combine my work and personal life activities throughout the day.	$c_3$ Eu controlo como conciliar meu trabalho e minha vida pessoal, ao longo do dia e da semana.

For the final validation study sample, participants who had failed to respond to one or more items were excluded, which resulted in 7,277 individuals (96.7% of the participants eligible). The mean age of the participants was 55 years ( $\pm 6$  years), with similar proportions of women (49.7%) and men (50.3%). Also similar were the percentages of those with higher education (37.0%) and upper secondary education (35.7%), while a smaller percentage had lower secondary education (27.3%). Most participants declared themselves to be white (52.1%), others brown (28.2%), black (15.6%), and yellow or indigenous (3.0%). Parallel analysis suggested three dimensions, which is corroborated by the theoretical structure of the scale. EFA then estimated the loading values freely at the three available eigenvalues, considering all 13 items in the scale. For the complete model, CFI and RMSEA fits were satisfactory. However, items  $a_3$  and  $a_4$

returned loadings below the cut-off point, while  $a_4$  showed partial loading in two different dimensions, its original one and the second dimension. Another indication of poor fit was the communality of items: 11% of the variance of the variable of item  $a_3$  and 16% of item  $a_4$  is explained by the factor analysis. Also, the proportion of accumulated variance explained in the three factors was 0.51. A second model was estimated after eliminating the two items identified in the analysis of the first model. Without those items, CFI and RMSEA returned acceptable fit, with all loadings  $>0.4$ . For the communality of items, the smallest value found was 28% for the first item. Also, the proportion of variance explain in the three factors was 0.58, that is, greater than value found previously and with fewer factors. The loading values of the TLI and RMSEA fit indicators are shown in **Table 1**.

**Table 1** Results of exploratory factor analysis and fit parameters for component items of the work-life indicator scale. ELSA-Brasil, 2017-2019 (n=7,277)

Items	Standardized factor loadings			Communality	Singularity
	Factor 1	Factor 2	Factor 3		
$a_1$ Eu cuido de questões pessoais ou familiares durante o trabalho.	0.02	0.55	-0.06	0.32	0.68
$a_2$ Eu respondo a comunicações pessoais (ex.: e-mails, textos/SMS, aplicativos e chamadas telefônicas) durante o trabalho.	0.00	0.75	0.01	0.57	0.43
$a_3$ Para manter o foco, eu não penso na minha família, amigos ou interesses pessoais enquanto trabalho.	-0.15	0.29	-0.18	0.11	0.89
$a_4$ Quando eu trabalho em casa, lido com responsabilidades pessoais ou familiares durante o trabalho.	0.32	0.25	0.08	0.16	0.84
$a_5$ Eu fico atento(a) em comunicações pessoais (ex.: e-mails, textos/SMS e chamadas telefônicas) quando estou trabalhando.	0.00	0.66	0.02	0.43	0.57
$b_1$ Eu levo trabalho para casa regularmente.	0.84	-0.05	0.01	0.69	0.31
$b_2$ Eu respondo a comunicações ligadas ao trabalho (p. ex. e-mails, textos/SMS e chamadas telefônicas) no meu tempo livre fora do trabalho.	0.72	0.06	0.08	0.48	0.52
$b_3$ Eu trabalho durante as férias.	0.81	-0.01	0.00	0.65	0.35
$b_4$ Eu deixo o trabalho interromper meus momentos com a família e amigos.	0.65	0.03	-0.12	0.53	0.47
$b_5$ Eu costumo levar materiais de trabalho quando participo de atividades pessoais ou familiares.	0.71	0.02	-0.08	0.58	0.42
$c_1$ Eu tenho condições de separar os assuntos de trabalho dos assuntos pessoais.	0.06	-0.04	0.84	0.67	0.33
$c_2$ Eu tenho condições de estabelecer limites bem claros entre o trabalho e minha vida pessoal.	-0.04	0.01	0.90	0.85	0.15
$c_3$ Eu controlo como conciliar meu trabalho e minha vida pessoal, ao longo do dia e da semana.	-0.05	0.03	0.76	0.62	0.38
Proportion of variance explained	0.23	0.11	0.17		
TLI / RMSEA			0.954 / 0.055		

TLI: Tucker-Lewis index; RMSEA: root mean square error of approximation.

Similarly, in the first stage of CFA, all the questions were introduced into Model 1 in their theoretical positions, that is, five items in the first dimension – Personal life invading work (PLW); five in the second dimension – Work invading personal life (WPL); and three in the third dimension – Perceived boundary control (BC).

In the original distribution of items, the fit indicator values were unsatisfactory (CFI=0.892; TLI=0.865; RMSEA=0.062). Also, the modification indices suggested shifting item  $a_4$  to the second or third dimension.

Following the pre-established stages, Model 2 was implemented without the two items that, in Model 1, returned factor loadings of less than 0.50. Initially, it was decided to maintain the last item of the first dimension, which returned loading of 0.493, that is,

very close to the cut-off point. For Model 2, the fit indicators were considered acceptable and all factor loadings satisfactory, including the borderline item, which returned a satisfactory loading of 0.531 in the new model. In this configuration, the largest modification index decreased from 852.97 to 77.65. The strongest correlation (0.474) was found between dimensions WPL and BC (**Table 2**).

After specification of the model by CFA, the next step was to calculate composite reliability, Cronbach's alpha, average variance extracted, and the correlations between dimensions, so as to analyze convergent and discriminant validities (**Table 3**). Composite reliability values ranged from 0.626 to 0.827; average variance extracted returned values from 0.268 to 0.609; and Cronbach's alpha values varied between 0.62 and 0.82.

**Table 2** Fit indicators, correlations, and factor loadings in confirmatory factor analysis (CFA) for the models of the work-life indicator scale tested – ELSA Brasil, 2017-2019 (n=7,277)

	Factor loading (Residual Variance)	
	Complete	Model 2
RMSEA	0.062	0.039
CFI	0.892	0.968
TLI	0.865	0.957
1. PLW ~ 2. WPL	0.206	0.149
1. PLW ~ 3. BC	-0.160	-0.109
2. WPL ~ 3. BC	-0.474	-0.474
$a_1$ Eu cuido de questões pessoais ou familiares durante o trabalho.	0.544 (0.704)	0.556 (0.690)
$a_2$ Eu respondo a comunicações pessoais (ex.: e-mails, textos/SMS, aplicativos e chamadas telefônicas) durante o trabalho.	0.559 (0.687)	0.704 (0.505)
$a_3$ Para manter o foco, eu não penso na minha família, amigos ou interesses pessoais enquanto trabalho.	0.244 (0.940)	-
$a_4$ Quando eu trabalho em casa, lido com responsabilidades pessoais ou familiares durante o trabalho.	0.459 (0.789)	-
$a_5$ Eu fico atento(a) em comunicações pessoais (ex.: e-mails, textos/SMS e chamadas telefônicas) quando estou trabalhando.	0.493 (0.757)	0.531 (0.718)
$b_1$ Eu levo trabalho para casa regularmente.	0.762 (0.420)	0.763 (0.417)
$b_2$ Eu respondo a comunicações ligadas ao trabalho (p. ex. e-mails, textos/SMS e chamadas telefônicas) no meu tempo livre fora do trabalho.	0.588 (0.654)	0.586 (0.657)
$b_3$ Eu trabalho durante as férias.	0.745 (0.445)	0.747 (0.441)
$b_4$ Eu deixo o trabalho interromper meus momentos com a família e amigos.	0.689 (0.525)	0.688 (0.527)
$b_5$ Eu costumo levar materiais de trabalho quando participo de atividades pessoais ou familiares.	0.704 (0.505)	0.703 (0.506)
$c_1$ Eu tenho condições de separar os assuntos de trabalho dos assuntos pessoais.	0.701 (0.509)	0.697 (0.514)
$c_2$ Eu tenho condições de estabelecer limites bem claros entre o trabalho e minha vida pessoal.	0.892 (0.205)	0.893 (0.202)
$c_3$ Eu controlo como conciliar meu trabalho e minha vida pessoal, ao longo do dia e da semana.	0.735 (0.460)	0.737 (0.457)

RMSEA: root mean square error of approximation; CFI: comparative fit index; TLI: Tucker-Lewis index; PLW: personal life invading work; WPL: work invading personal life; BC: boundary control.



**Table 3** Validity indicators for the dimensions of the work-life indicator scale – ELSA-Brasil, 2017-2019 (n=7,277)

Dimension	CR	AVE	Correlations <sup>2</sup>		
			PLW	WPL	BC
1. PLW	0.626	0.268	1	-	-
2. WPL	0.827	0.490	0.0424	1	-
3. BC	0.822	0.609	0.0119	0.2247	1

CR: composite reliability; AVE: average variance extracted; PLW: personal life invading work; WPL: work invading personal life; BC: boundary control.

Lastly, evaluation of residual correlations between items returned values from 0.074 to 0.058 for all pairs evaluated, indicating proper fit, according to the criterion set (data not shown in table).

## Discussion

This study demonstrated the steps taken for the transcultural adaptation of a scale without precedent in Brazil, which evaluates the boundaries between personal life and work, considering both when work invades personal life and the contrary. Additionally, the instrument contains the dimension of “perceived boundary control,” which assesses the degree to which workers’ allow their roles to be segmented or permeable. The findings show that the transcultural adaptation of the work-life indicator scale to its Brazilian version was satisfactory, enabling it to be used in future epidemiological studies. However, two items in the “personal life invading work” dimension returned low factor loadings and prevented acceptable fit indices, the analyses recommended their withdrawal.

The wording of these two items may possibly explain factor analysis’ recommending they be eliminated. The first item excluded (*para manter o foco, eu não penso na minha família, amigos ou interesses pessoais enquanto trabalho* [originally: I do not think about my family, friends, or personal interests while working so I can focus]), in addition to aggregating information from different aspects of life, the sentence contains a negative assertion, which may have led to some confusion in interpreting the real meaning of the expression. The second item (*quando eu trabalho em casa, lido com responsabilidades pessoais ou familiares durante o trabalho* [originally: When I work from home, I handle personal or family responsibilities during work]) may have allowed for various interpretations since not everyone experiences the situation of working from home. These aspects were not detected at the pre-test and pilot study stages. We suggest for future studies to maintain these two items in data collection and

assess the appropriateness of excluding them in different contexts. Moreover, studies to assess qualitatively how workers interpret these items may help understand why they were inappropriate in the Brazilian context.

This study found the dimensions to be appropriate regarding their composite reliability: the second and third dimensions scored values in excess of 0.70; and the first, scored a borderline value, according to the criterion adopted. All Cronbach’s alpha values – for the first dimension, borderline (0.62), and for the following two, satisfactory (0.82) – were considered acceptable. Evaluation of convergent validity found factor loadings to be sufficient, although the first dimension returned an inappropriate AVE (0.268), the second, a borderline value (0.490), and only the third, a satisfactory value (0.609). Discriminant factor validity, assessed by comparing the values of the squares of correlations between dimensions with the AVE values for each dimension, was found to be satisfactory in all dimensions. EFA corroborated the results obtained by CFA. Even leaving the factors to be freely estimated, except for the loadings that were excluded in the final model, all others proved to belong in their dimensions and returned loadings in excess of 0.4.

Thus, using the chosen criteria, Model 2 was found to be partly satisfactory in dimensional validity and unsatisfactory only in convergent factor validity, and then only in the first dimension.

Few international studies have evaluated the scale’s dimensional validity, limiting comparisons with these findings. Of studies that have used the scale, only ten have applied any form of psychometric analysis, all by using the Cronbach alpha coefficient. Even the initial proposal by Kossek et al.<sup>21</sup> does not give the factor loading values obtained in psychometric analysis. Earlier studies<sup>7,10-12,21,22,25,29,31</sup> found internal consistency values ranging from 0.64 to 0.86 for the “Personal life invading work” dimension, 0.71 to 0.86 for “Work invading personal life” and 0.82 to 0.91 for “Perceived boundary control” – that is, values similar

to those found in this study (0.62 for PLW and 0.82 for the other two, WPL and BC).

The strengths of this article lie in the quality of the transcultural adaptation process, data collection performed by a specifically trained team of specialists, as well as the ample consideration given to the evaluations that made up the stages of transcultural adaptation in a wide-ranging sample of Brazilians with differing socio-demographic characteristics.

However, the composition of the ELSA-Brasil population – civil servants with a level of education that is higher than average for Brazil – limited its representativeness. Kossek et al.<sup>21</sup> profiled workers in terms of the frequency of interruption behavior matching the most common characteristics of workers who intended to change job or had difficulty adjusting their working hours or using time appropriately. However, as ELSA-Brasil is a study of civil servants, most of whom are tenured, it may not be possible to generalize the findings to all Brazilian workers. The dimensions of integration, segmentation and control of boundaries between personal life and work (and what these represent in relation to the underlying theory) assume a relevance to the study population. This analysis should be conducted through two lenses: firstly, civil servants' conditions of employment afford them more functional independence, so they enjoy greater autonomy in separating personal life and work. Moreover, one must consider what individuals consider to be work. In a study<sup>9</sup> of Brazilian teachers, most (76%) of the participants admitted taking work home, but when asked about specific situations at work, all the interviewees reported doing so. Therefore, what workers consider to be work and what they consider natural to their job training must be clearly defined.

Notably, the scale studied here was not developed specifically for the study of sex or gender differences in permeability between life at work and away from

work and its health effects<sup>5,21</sup>. However, the scale allows us to explore the implications of gender differences in the Brazilian context and the health effects of not managing boundaries between personal life and work. We suggest for future studies to also evaluate invariance in the dimensional validity of the scale, by sex or gender and other socioeconomic variables, particularly age and schooling.

Although the remote model of work is a growing reality in the contemporary world, certain new concepts relating to it and its interference have played a more prominent role since the late-2019 onset of the Covid-19 pandemic, which called for worldwide measures to restrict movement and impose physical isolation. Accordingly, many workers in all manner of fields suddenly had to accommodate to new realities and perform their functions from home. Until then, home working was more usual among technology professionals, while all others were allowed a geographical barrier between the two environments. This new scenario has reinforced the need for instruments to evaluate the permeability between professional and personal life, as well as its health effects.

## Conclusion

This study brought a scale into epidemiology in Brazil to evaluate management of boundaries between work and personal life roles. Transcultural adaptation and dimensional validity assessment of the scale indicates a promising use for research in Brazil on how segmentation or permeability between these two roles impact workers' health and quality of life. Such studies can collaborate with public policymaking endeavors that contemplate the boundaries between work and personal life and their implications for workers' health and wellbeing.

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## Acknowledgements

We thank all participants in ELSA-Brasil for their valuable contributions to this study.

## Authors' contributions

Fernandes JA, Souto EP and Griep RH contributed substantially to the study conception and design, data acquisition, analysis and interpretation and drafting of the preliminary version of the manuscript. Rotenberg L, Moreno AB, Aguiar OB and Fonseca MJM contributed to analysis and interpretation of the findings and critical review of the intellectual content. All authors approved the final version for publication and take public responsibility for the work done and the content published here.

## Data availability

The authors declare that the whole dataset supporting the findings of this study is available on request to the corresponding author. The data are from the data base of the Longitudinal Study of Adult Health (*Estudo Longitudinal de Saúde do Adulto*, ELSA-Brasil), which has a multicentre coordination in the six Brazilian cities that form part of this study. The data bases were made available on approval of the study proposals submitted to the Elsa Publications Committee.

Received: May 09, 2022  
Reviewed: October 04, 2022  
Approved: November 18, 2022

Responsible Editor-in-Chief:  
Eduardo Algranti