Construct validity of the Individual Lifestyle Profile scale in times of social distancing

Validade de constructo da escala Perfil do Estilo de Vida Individual em tempos de distanciamento social

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ABSTRACT

The aims of the study were to estimate the level of reliability and factorial validity of the "Individual Lifestyle Profile" scale in times of social distancing, through confirmatory factor analysis (CFA). Therefore, the "Individual Lifestyle Profile" scale in times of social distancing was used in a study carried out with samples of students and employees of higher education institutions from different Brazilian regions. The final sample consisted of 4,694 adults who have answered the online form. For construct evaluation, internal consistency analysis was performed using *Cronbach's Alpha* (α) and *Spearman's* correlation. The CFA was used to test the hypothetical factor structure of the scale. Overall internal consistency was α = 0.778 and there were significant correlations, however, less than ± 0.799 for items from the same constructs and ± 0.499 among items from different constructs. In the CFA, after adjustments to the model structure, all indicators were adequate (Goodness-of-fit Index: 0.976; Comparative Fit Index: 0.937; Normalized Fit Indices: 0.932; Tucker-Lewis Indices: 0.914; Root Mean Square Error of Approximation: 0.047; Root Mean-Square Residual: 0.031; Standardized Root Mean-Square Residual: 0.0337), with the exception for chi-square p values and the ratio between chi-square and degrees of freedom. It is concluded that the "Individual Lifestyle Profile" scale in times of social distancing has shown satisfactory internal consistency and factor structure to guide the assessment of lifestyle (individual or groups) and interventions to promote healthy lifestyles.

Keywords: COVID-19; Adults; Social isolation; Behavior rating scale.

RESUMO

Os objetivos do estudo foram estimar o nível de confiabilidade e validade fatorial da escala "Perfil do Estilo de Vida Individual" em tempos de distanciamento social, por meio da análise fatorial confirmatória (AFC). Para tanto, a escala "Perfil do Estilo de Vida Individual" em tempos de distanciamento social foi empregada em um estudo realizado com amostras de estudantes e servidores de instituições de ensino superior de diferentes regiões brasileiras. A amostra final correspondeu a 4.694 adultos que responderam o formulário on-line. Para a avaliação de constructo foi realizada a análise de consistência interna via Alfa de Cronbach's (α) e correlação de Spearman. Empregou-se a AFC para testar a estrutura fatorial hipotética da escala. A consistência interna geral foi de α de 0,778 e houve correlações significativas, porém, inferiores a ± 0,799 para os itens dos mesmos constructos e ± 0,499 entre os itens de constructos diferentes. Na AFC, após ajustes na estrutura do modelo, ocorreu a adequação para todos os indicadores (Goodness-of-fit Index: 0,976; Comparative Fit Index: 0,937; Normalized Fit Indices: 0,932; Tucker-Lewis Indices: 0,914; Root Mean Square Error of Approximation: 0,047; Root Mean-Square Residual: 0,031; Standardized Root Mean-Square Residual: 0,0337), com a exceção para os valores de p do Qui-quadrado e razão entre Qui-quadrado e graus de liberdade. Conclui-se que a escala "Perfil do Estilo de Vida Individual" em tempos de distanciamento social, mostrou consistência interna e estrutura fatorial satisfatórias para orientar a avaliação do estilo de vida (individual ou de grupos) e as intervenções para promover estilos de vida saudáveis.

Palavras-chave: COVID-19; Adultos; Isolamento social; Escala de avaliação comportamental.

Introduction

Lifestyle, understood as a set of habitual actions that reflect attitudes, values and opportunities in people's lives[1] was considerably influenced by COVID-19[2]. The impact of the new coronavirus on different communities, due to the need for physical-social distancing[3], included changes in the usual practice of physical activities and increased consumption of psychoactive substances, such as alcohol and cigarettes[2], with impacts on increased body weight and mental health status[4]. Behavior changes regarding the feeling of sadness, depression, anxiety and nervousness were recurrent in the

population[5] due to the significant increase in cases of infections and deaths caused by COVID-19[6,7].

In this context, investigations into the relationship between the pandemic and lifestyle are important for the development and implementation of educational and motivational strategies aimed at alleviating the adverse effects of COVID-19. However, to carry out studies during the pandemic, with the potential to reliably measure population characteristics, the use of measures sensitive to this specificity becomes essential[8].

The "Individual Lifestyle Profile" scale, derived from the conceptual model referred to as the Well-Being Pentacle which encompasses five dimensions of lifestyle (physical activity, nutrition, relationships, stress management and preventive behaviors), presents satisfactory psychometric skills, such as levels of agreement ranging from 74% to 94%[1,9] and explained variance of 53.6%[10]. However, due to the pandemic context, it is interesting to use specific instruments for this reality in research[11,12].

Faced with the COVID-19 pandemic, which began in Brazil in early 2020, Santos et al.[13] resorted to adapting this scale for online use, with a focus on measuring the lifestyle of adults during physical-social distancing, observing satisfactory levels of adequacy, relevance and clarity, and consistent reproducibility (Kappa values between 0.358 and 0.626). Thus, considering the need to establish the precision levels of this scale for measuring lifestyle during the pandemic, this study aimed to estimate the level of reliability and factorial validity of the "Individual Lifestyle Profile" scale sin times of social distancing through confirmatory factor analysis (CFA).

Methods

This cross-sectional study is derived from the baseline survey "Impact of the COVID-19 pandemic on the lifestyle of students and staff at higher education institutions", which was approved by the human research ethics committees of the following institutions: Federal University of Recôncavo da Bahia (UFRB), CAEE 33377120.0.0000.0056; Federal University of Southern Bahia (UFSB), CAEE 33377120.0.3010.8467; Federal University of Bahia (UFBA), CAEE 33377120.0.3005.5531; State University of Santa Cruz (UESC), CAEE 33377120.0.3007.5526; Federal University of Amazonas (UFAM), CAEE 33377120.0.3002.5020; Federal University of Alagoas (UFAL), CAEE 33377120.0.3008.5013; Federal University of Triângulo Mineiro (UFTM), CAEE 33377120.0.3006.5154; Federal University of Viçosa (UFV), CAEE 33377120.0.3003.5153; Fe-

deral University of Mato Grosso do Sul (UFMS), 33377120.0.3001.0021; Federal University of Santa Maria (UFSM), CAEE 33377120.0.3004.5346 and University Center of Southwestern Paraná (UNISEP), CAEE: 33377120.0.3009.5230. Participants consented to participate via the Free and Informed Consent Term (FICF).

The target population of this study consisted of undergraduate students and civil servants (educational technicians and professors) from the following institutions: UFRB, UFSB, UFBA, UESC, UFAM, UFAL, UFTM, UFV, UFMS, Faculty of Santa Maria (FSM) and UNISEP. The sample size was estimated considering the ratio of 10 participants for each of the 15 items of the scale to be validated through the CFA[14]. Thus, the minimum required sample was 150 participants. The convenience sampling method was used for the selection.

People who had an active institutional link with the institutions were included, such as regular enrollment for undergraduate students and being a permanent or temporary servant for professors and administrative educational technicians. Participants under the age of 18, university students who had already completed the course and civil servants who were on vacation were excluded. This exclusion occurred after data tabulation, through the questions included in the instrument and also presented in the FICF.

The initial data collection (baseline) was carried out online between August and October 2020. The survey instrument was made available on the digital platform of the Google® management application (Google Forms). The anonymity of the participants was guaranteed, as the questionnaire did not contain information for personal identification. Before participating in the research, the consent form was presented in an online format and the participant informed by choosing the option to accept or not. Upon acceptance, the participant informed their email address to receive a copy of the FICF with the research coordinator's signature. Invitations to participate in the research were sent via electronic emails from the target audience of the study. They were also made available on the institutions' official social networks, with the link to access the research instrument.

The research instrument comprised a questionnaire with the "Individual Lifestyle Profile" scale in times of social distancing[13], in addition to sociodemographic data, institutional affiliation and regarding living conditions during the pandemic. The adapted scale comprises lifestyle in five components: physical activity, healthy eating, stress management, relationships and

preventive behaviors, with three items per component, corresponding to the letters of the alphabet from A to O. The answer options are arranged on a Likert scale with four options, as follows: (0) absolutely not part of their lifestyle; (1) sometimes matches their behavior; (2) almost always true in their behavior; (3) the statement is always true in their daily life; it's part of their lifestyle.

Sociodemographic variables were gender (male and female) and age in full years. The possibilities of bonding with the institution were that of a student, technician or professor.

Data were transferred directly to the *Excel* software, version 2109 of *Microsoft 365*, which allows the tabulation of information for each participant according to each research variable. Descriptive analysis of mean, standard deviation (SD), absolute and relative frequencies were used, complemented by asymmetry and kurtosis analysis, in addition to internal consistency analysis via *Cronbach's Alpha* (α) and *Spearman's* correlation via *Statistical Package for the Social Sciences* (SPSS) software, version 24.0, intended for the use of statistical analysis. The classification used for the values of general α and by domain of the scale were: >0.9 = excellent; 0.8 to 0.9 = good; 0.7 to <0.8 = reasonable; 0.6 to <0.7 = weak; <0.6 = unacceptable[15]. In order to analyze a possible conflict between the items of the scale, the values of up to ± 0.799 for items of the same constructs and up to ± 0.499 between items of different constructs were considered satisfactory correlations[16].

To carry out the CFA, the statistical package AMOS version 24.0 was used, which represents a tool for the use of structural equation modeling. The *maximum likelihood* estimation method was adopted, respecting a minimum number of 10 observations per item[17]. After specifying and estimating the model, the adequacy was evaluated by the following adjustment/adequacy indices: χ^2 value (chi-square), with the adjustment through the non-significant p value (p > 0.05); ratio of χ^2 by degrees of freedom (*df*), represented by χ^2/df, with values below 2.0 as acceptable[18,19]; *Goodness-of-fit Index* (GFI), *Comparative Fit Index* (CFI), *Normalized Fit Index* (NFI) and *Tucker-Lewis Index* (TLI), considered satisfactory for an adequate adjustment to values above 0.90[20]; *Root Mean Square Error of Approximation* (RMSEA) and 90% confidence interval (90%), with acceptable adequacy value less than 0.062[1], *Root Mean-Square Residual* (RMR) and *Standardized Root Mean-Square Residual* (SRMR), with indices considered to be of good fit value lower than 0.082[1]. In all

analysis a significance level of 5% was adopted.

Results

The number of responses obtained from the electronic forms was of 4,980. A total of 169 duplicate responses were excluded and there were two refusals, resulting in 4,809 valid responses. After excluding the forms that did not answer one or more items of the "Individual Lifestyle Profile" scale in times of social distancing, the sample of this study consisted of 4,694 participants. A total of 3,476 students (74.1%), 385 educational administrative technicians (8.2%) and 830 professors (17.7%) participated in the study. The average age was 30.45 (SD = 11.65) years old and 65.9% were female (n = 3,085).

Table 1 presents the descriptive and reliability analysis of the scale. It was observed that all items presented satisfactory distribution of asymmetry and kurtosis, except for item N – "I maintain physical distance and wear a mask whenever I need to go out". As for internal consistency, in general, the value of α was considered reasonable. However, the domains healthy eating and physical activity presented values considered weak, and the other constructs presented the level unacceptable.

Table 2 shows the correlations between the scale items. Significant correlations were observed between most items. However, they were lower than the criterion values established in this study.

The CFA indicators are described in Table 3. In the initial analysis, inadequate indices of adjustment to the model were observed for the p value of χ^2, χ^2/df and TLI. Adjustments were made according to the observation of change rates by observing correlations between the errors of the same factors. Therefore, adjustments were made to the structure of the model, which is shown in Figure 1. After observing the correlations between the errors of items A - "I eat 3 or 4 meals a day, at somewhat regular times" and C - " I avoid including fatty foods and sugary food in my meals", errors in items E - "I have a daily routine that includes physical activities (gymnastics, stretching, yoga, climbing stairs, etc.)" and F - "I walk or ride a bike, keeping a safe distance, when I need to go to nearby places", errors in items G - "I try to fill most of my day with interesting activities" and H - "When I feel lonely or anxious I look for help from family and friends, even virtually" and errors in items K - "I try to get to know myself more and more, valuing spirituality/religiosity" and L - "Even in isolation, I try to remain useful in the community", all indicators were adequate, with the

Table 1 – Descriptive analysis and level of reliability of the "Individual Lifestyle Profile" scale in times of social distancing. 2020.

Domains and scale items	Not part of the lifestyle n (%)	Occasionally n (%)	Almost always n (%)	Always n (%)	Asymmetry	Kurtosis	α
Healthy eating							
A. I have 3 or 4 meals a day, at somewhat regular times.	343 (7.3)	1,000 (21.3)	1,524 (32.5)	1,827 (38.9)	-0.579	-0.714	0.625
B. I include fruits and vegetables in my meals.	191 (4.1)	1,405 (29.9)	1484 (31.6)	1,614 (34.4)	-0.266	-1.054	
C. I avoid including fatty and sugary foods in my meals.	873 (18.6)	2,004 (42.7)	1,351 (28.8)	466 (9.9)	0.240	-0.649	
Physical Activity							
D. I take breaks and move when I spend a lot of time sitting.	928 (19.8)	1,987 (42.3)	1,110 (23.6)	669 (14.3)	0.318	-0.791	0.666
E. I have a daily routine that includes physical activities (gymnastics, stretching, yoga, climbing stairs, etc.).	1,558 (33.8)	1,425 (30.4)	814 (17.3)	867 (18.5)	0.423	-1.151	
F. I walk or cycle, keeping a safe distance when I need to go to nearby places.	1,426 (30.4)	1,024 (21.8)	933 (19.9)	1,311 (27.9)	0.067	-1.510	
Stress management							
G. I try to occupy most of my day with interesting activities.	480 (10.2)	1,832 (39.0)	1,540 (32.8)	842 (17.9)	0.065	-0.814	0.577
H. When I feel lonely or anxious I look for help from family and friends, even virtually.	1,087 (23.2)	1,607 (34.2)	1,152 (24.5)	848 (18.1)	0.197	-1.099	
I. I set aside a few moments in my day to relax, read, listen to music or meditate.	509 (10.8)	1,523 (32.4)	1,327 (28.3)	1,335 (28.4)	-0.143	-1.101	
Relationships							
J. I keep frequent contact/ have conversations, even virtually, with close friends and relatives.	245 (5.2)	1,109 (23.6)	1,340 (28.5)	2,000 (42.6)	-0.560	-0.838	0.564
K.I try to get to know myself more and more, valuing spirituality/religiosity.	1,074 (22.9)	1,353 (28.8)	1,061 (22.6)	1,206 (25.7)	0.034	-1.332	
L. Even in isolation, I try to remain useful in the community.	873 (18.6)	1,630 (34.7)	1,219 (26.0)	972 (20.7)	0.093	-1.107	
Preventive behaviors							
M. I often wash my hands and use alcohol gel for hands and everyday objects	82 (1.7)	506 (10.8)	1,110 (23.6)	2,996 (63.8)	-1.344	0.913	0.397
N. I keep physical distance and wear a mask whenever I need to go out.	26 (0.6)	105 (2.2)	519 (11.1)	4,044 (86.2)	-3.098	10.543	
O. I avoid excessive consumption of alcoholic beverages.	413 (8.8)	636 (13.5)	822 (17.5)	2,823 (60.1)	-1.129	-0.078	
General							0.778

% = Proportion; α = Cronbach's Alpha.

exception of the p value of χ² , χ²/df. Factor loadings ranged from 0.24 for item O - "I avoid excessive alcohol consumption" to 0.76 for item D - "I take breaks and move when I spend a lot of time sitting".

Discussion

This study sought to estimate the level of reliability and factorial validity of the "Individual Lifestyle Profile" scale for online use in adults in times of social distancing, due to the COVID-19 pandemic. This scale showed reasonable general internal consistency and sa-

tisfactory adjustment indices through the convergence of items to latent constructs. The level of explanation for each item was reasonable and acceptable levels of multicollinearity were observed.

The present scale, which was adapted from its version developed for application in adults[1,9], showed satisfactory levels of general internal consistency. The α value of 0.778 in this study was similar to the index found in a previous study carried out with the original version, which observed an internal consistency of 0.78[10]. As for the levels of internal consistency by

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Table 2 – Correlations between the items of the "Individual Lifestyle Profile" scale in times of social distancing. 2020.

Items	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
A	1.00[a]	0.448*[a]	0.261*[a]	0.277*	0.270*	0.116*	0.221*	0.218*	0.186*	0.211*	0.176*	0.182*	0.153*	0.089*	0.121*
B	0[a]	1.000[a]	0.384*[a]	0.311*	0.326*	0.182*	0.231*	0.213*	0.187*	0.199*	0.192*	0.214*	0.184*	0.127*	0.075*
C	-	-	1.000[a]	0.285*	0.291*	0.174*	0.207*	0.123*	0.097*	0.079*	0.175*	0.171*	0.108*	0.052*	0.090*
D	-	-	-	1.000[a]	0.527*[a]	0.311*[a]	0.331*	0.196*	0.285*	0.201*	0.237*	0.228*	0.124*	0.040*	0.029*
E	-	-	-	-	1.000[a]	0.386*[a]	0.273*	0.159*	0.212*	0.173*	0.198*	0.192*	0.065*	-0.005	0.005
F	-	-	-	-	-	1.000[a]	0.236*	0.083*	0.157*	0.124*	0.136*	0.167*	0.093*	0.064*	0.046*
G	-	-	-	-	-	-	1.000[a]	0.255*[a]	0.383*[a]	0.255*	0.293*	0.326*	0.130*	0.087*	0.083*
H	-	-	-	-	-	-	-	1.000[a]	0.299*[a]	0.439*	0.260*	0.249*	0.126*	0.072*	0.052*
I	-	-	-	-	-	-	-	-	1.000[a]	0.338*	0.275*	0.195*	0.085*	0.086*	0.069*
J	-	-	-	-	-	-	-	-	-	1.000[a]	0.279*[a]	0.261*[a]	0.133*	0.108*	0.035*
K	-	-	-	-	-	-	-	-	-	-	1.000[a]	0.355*[a]	0.143*	0.037*	0.117*
L	-	-	-	-	-	-	-	-	-	-	-	1.000[a]	0.199*	0.076*	0.050*
M	-	-	-	-	-	-	-	-	-	-	-	-	1.000[a]	0.361*[a]	0.140*[a]
N	-	-	-	-	-	-	-	-	-	-	-	-	-	1.000[a]	0.163*[a]
O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.000[a]

*P value < 0.05; a = correlations between items in the same domain.

Table 3 – Confirmatory factor analysis indicators referring to the "Individual Lifestyle Profile" scale in times of social distancing. 2020.

Adjustment Indicators	Inappropriate	Appropriate
P value (χ^2; df)	< 0.001 (113.943; 80)	<0.001 (863.822; 76)
χ^2/df	13.924	11.366
GFI (Goodness-of-fit Index)	0.968	0.976
CFI (Comparative Fit Index)	0.918	0.937
NFI (Normalized Fit Indices)	0.912	0.932
TLI (Tuker-Lewis Indices)	0.892	0.914
RMSEA (Root Mean Square Error of Approximation) (IC90%)	0.052 (0.050 – 0.055)	0.047 (0.044 – 0.050)
RMR (Root Mean-Square Residual)	0.034	0.031
SRMR (Standardized Root Mean-Square Residual)	0.0366	0.0337

χ^2 = chi square; df = degrees of freedom.

domain, it was observed that the constructs healthy eating and physical activity presented values considered weak and the other constructs presented an unacceptable classification. These results are similar to the original version of the scale[10]. The adapted version has characteristics that are similar to the original scale and thus represents the conceptual model of adult lifestyle.

Other studies had already demonstrated the quality of pen-and-paper instruments to measure information about lifestyle in general[22] and in relation to specific behaviors, such as attitudes regarding eating habits[23,24]. However, recently, and due to the new coronavirus pandemic, other studies were carried out to present the psychometric properties of new lifestyle instruments[11,12], in a similar way to this study.

The internal consistency of the scale of this study at a reasonable level was lower than that observed in the

instrument focusing on lifestyle changes during the COVID-19 pandemic, which identified an α of 0.83[11]. On the other hand, another study observed an internal consistency level with α equal to 0.72 for a scale designed to estimate changes in lifestyle during the pandemic[12]. Reliability values of these instruments demonstrate that the psychometric properties are satisfactory for measuring health-related behaviors. It is important to characterize that the differences between the instruments occur as a function of the investigated behaviors and the temporal focus on the recall, as the scale of the present study estimates the current state of lifestyle during the pandemic and not the possible changes over time.

The "Individual Lifestyle Profile" scale in times of social distancing has presented adequate adjustment indicators, with the exception of indicators related to the p value of χ^2 and χ^2/df. These indices are sensi-
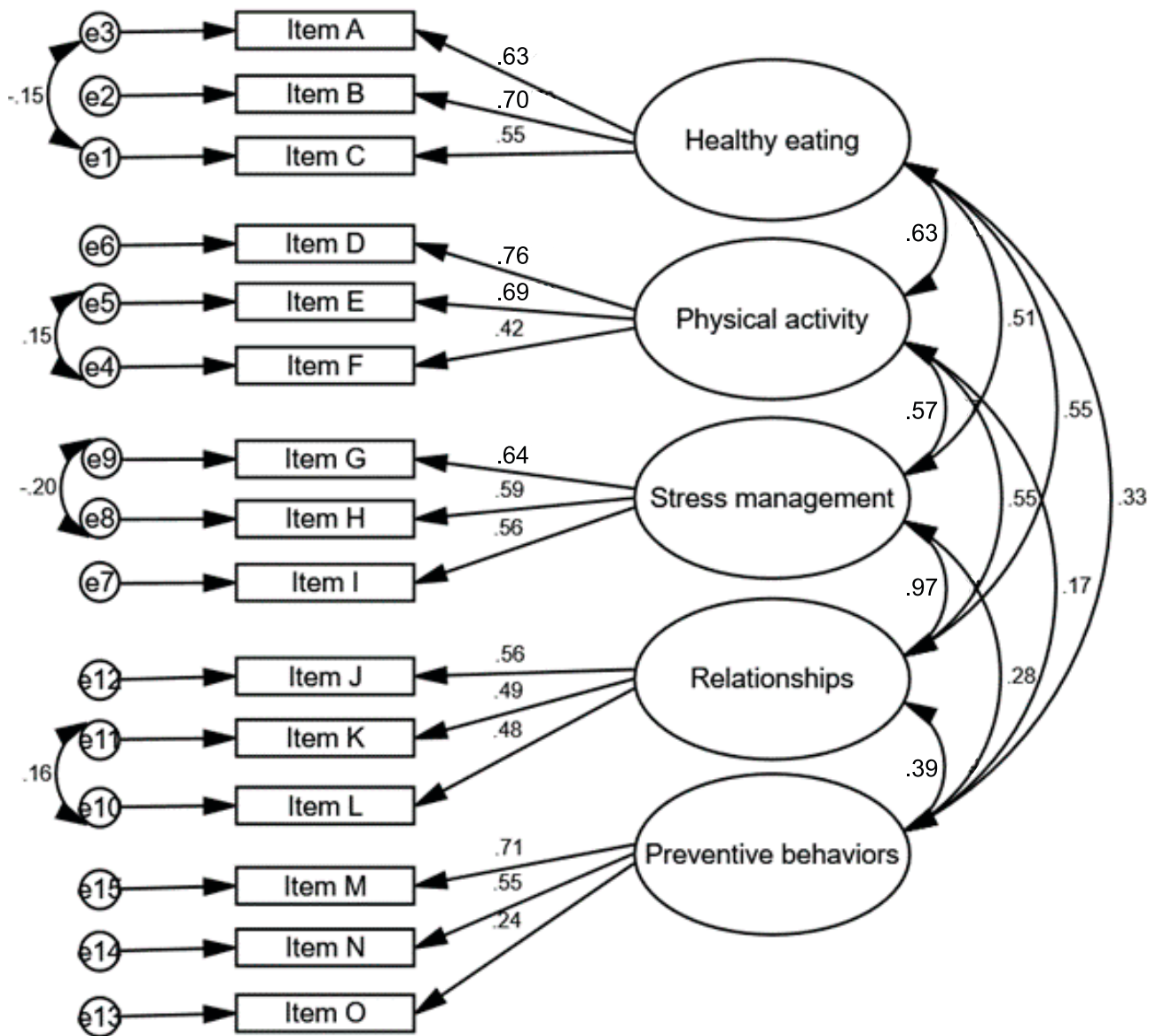
Figure 1 – Structure presentation according to confirmatory factor analysis of the "Individual Lifestyle Profile" scale in times of social distancing. 2020.

tive to sample size, which can thus contribute to inadequate adjustment values[25]. Furthermore, adjustments were made to the final structure of the model, as the existence of negative correlations between the errors of items A and C, and between items G and H, and positive correlations between the errors of items E and F were observed, and among the errors of items K and L. The relationships between these items are acceptable, as high multicollinearity values were not observed between the items of this adapted scale, and the original version had previously shown moderate levels of correlations between items "A" and "C", "D" and "E", "K" and "L", and "M" and "O"[10].

It has been noted that among the factor loadings, the item with the lowest explanatory value was item O - "I avoid excessive alcohol consumption" for the Preventive Behavior construct. This result may be linked to the profile of the other items in this construct, which deal with actions during the pandemic such as washing hands and using alcohol gel, and the implementation of physical-social distancing, which refer to more specific behaviors for the pandemic[3,6]. Item O does not necessarily have this profile. Furthermore, the consumption of alcoholic beverages can be perceived by society as a behavior associated with joy and relaxation, with nationwide popularity, and not necessarily as harmful to health[26].

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On the other hand, the item that best explained the scale was item D (I take breaks and move when I sit for a long time), with a value of 0.76. The changes that occurred in behavior during the pandemic caused, among others, the increase in time spent in sedentary activities[2], as in the case of students and higher education employees. Thus, the level of physical activity became one of the main behaviors focused on during the COVID-19 pandemic, given the recognition of the protective effect of regular practice[27].

As for this study, limitations are mentioned regarding the participation process, which was by convenience in an online format; thus, only those with internet access and more likely to participate in the research were volunteers[8]. Furthermore, the participants are exclusively adults and with a higher level of education, so caution is suggested regarding the use of the scale in adults with a lower level of education. However, due to the pandemic period, data collections without face-to-face contact were essential[8] and followed the increase in research lines and groups with an emphasis on the new coronavirus pandemic[28]. In the Brazilian context, this is one of the first scales designed to measure information about lifestyle during the COVID-19 pandemic and was elaborated with methodological rigor[29], given the relevance of characterizing this information, which demonstrates a fundamental role during the COVID-19 pandemic[30].

Thus, considering the need to estimate the level of reliability and factorial validity of the "Individual Lifestyle Profile" scale for online use in adults in times of social distancing, for usage during the pandemic, as in a result of COVID-19, it is concluded that the referred scale has presented acceptable levels of internal consistency in general and good adjustment of the 15 items regarding the five constructs, as presented in the conceptual model of the Well-Being Pentacle. It is suggested that this scale be applied for motivational and educational purposes, aiming at the diagnosis and monitoring of more active and healthier lifestyles during the pandemic, and that its completion can help in decision-making for a lower risk of health problems.

Conflict of interest

The authors declare no conflict of interest.

Author Contributions

Sousa TF prepared and coordinated the study, performed the statistical analysis and drafted the article. Santos SFS prepared and coordinated the study and drafted the article. Fonseca SA is part of the study team, developed the research instrument and carried out a critical review of the article. Barros GR wrote the article. Barros MVG prepared the research instrument and carried out a critical review of the article. Nahas MV elaborated the research instrument and carried out a critical review of the article.

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