



ORIGINALES

Validation of a scale of healthy lifestyles in Mexican university students

Validación de una escala de estilos de vida saludable en estudiantes universitarios mexicanos

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<https://doi.org/10.6018/eglobal.556921>

Received: 10/02/2023

Accepted: 5/03/2023

ABSTRACT:

Objective: To determine the psychometric properties of the Scale of Healthy Lifestyles for University Students (EEVSEU) for male and female university students in Mexico.

Materials and methods: Validity evidence regarding the structure and measurement invariance of the EEVSEU was evaluated by confirmatory factor analysis. Initially, two models were evaluated: the original model (8 dimensions) and the model obtained in Mexican women (4 dimensions). The magnitude of the factorial loads of each item (≥ 0.50) and the reliability of the scores and the construct of the models were determined through the alpha and omega coefficients. Finally, the association between healthy lifestyles and psychological well-being and self-regulation of eating habits was analysed.

Results: After the initial analyses, a new model was constructed with 7 dimensions of the EEVSEU (exercise, regular behaviour, nutritional behaviour, health responsibility, social support, stress management and appreciation for life) (M3). It evidenced adequate factorial parameters (adjustment indices and factorial loads), was invariant between men and women and significantly associated with the self-regulation of eating habits and psychological well-being.

Conclusions: The EEVSEU has adequate psychometric properties for its application in studies involving male and female university students in Mexico.

Keywords: Students; healthy lifestyle; reliability; validity.

RESUMEN:

Objetivo: Determinar las propiedades psicométricas de la Escala de Estilos de Vida Saludables para Estudiantes Universitarios (EEVSEU) en hombres y mujeres estudiantes universitarios mexicanos.

Material y método: Fueron evaluadas las evidencias de validez respecto a la estructura e invarianza de medición de la EEVSEU mediante análisis factorial confirmatorio. Inicialmente se evaluaron dos modelos: el modelo original (8 dimensiones), y el modelo obtenido en mujeres mexicanas (4 dimensiones). Se determinó la magnitud de las cargas factoriales de cada ítem ($\geq 0,50$) y la fiabilidad de las puntuaciones y del constructo de los modelos a través de los coeficientes alfa y omega. Finalmente se analizó la asociación entre los estilos de vida saludable con el bienestar psicológico y con la autorregulación de los hábitos alimentarios.

Resultados: Luego de los análisis iniciales, se consideró un nuevo modelo con 7 dimensiones de la EEVSEU (ejercicio, comportamiento regular, comportamiento nutricional, responsabilidad en salud, apoyo social, manejo del estrés y apreciación por la vida) (M3), el cual evidencio parámetros factoriales adecuados (índices de ajuste y cargas factoriales), además ser invariante entre hombres y mujeres y asociarse de forma significativa con la autorregulación de los hábitos alimentarios y el bienestar psicológico.

Conclusiones: La EEVSEU presenta adecuadas propiedades psicométricas para su aplicación en hombres y mujeres estudiantes universitarios mexicanos con fines de investigación.

Palabras clave: Estudiantes; estilo de vida saludable; confiabilidad; validez.

INTRODUCTION

Healthy lifestyles (EVS) are associated with better health that reduces mortality, increases life expectancy⁽¹⁾, improves psychological well-being and reduces symptoms of depression, anxiety⁽²⁾ and the risk of developing chronic diseases⁽³⁾. Therefore, EVS are considered one of the main strategies for health promotion and disease prevention.

Although the promotion of EVS is important for all age groups, the availability of approach and measurement strategies vary among them. Young people, particularly Mexican university students, are a particularly important group to target because they are in the process of developing health-related habits and behaviours; their lifestyles can negatively affect their health⁽⁴⁾ due to inadequate diet, low levels of physical activity, poor quality of sleep, high levels of stress and consumption of tobacco or alcohol⁽⁵⁾. University students who live with excess weight present low levels of appreciation for life and poor eating, studying and resting habits, especially when compared to students of normal weight⁽⁶⁾.

Prior to the COVID-19 pandemic, differences in health habits between men and women were already evident: women had less substance use, while men had better nutrition, study and rest⁽⁶⁾. During the COVID-19 pandemic, differences continued: women increased the number of meals per day, and men increased their consumption of sweet foods⁽⁵⁾. The pandemic also affected young people: the time of exposure to electronic devices exceeded 10 continuous hours, physical activity decreased⁽⁵⁾ and sedentary behaviours increased⁽⁷⁾.

These changes are a serious concern considering the state of health of the Mexican population before the pandemic. In 2018, the combined prevalence of overweight and obesity in the population over 20 years of age was 75.2% (39.1% overweight and 36.1% obesity), which was higher in women (76.8%) than men⁽⁸⁾. In 2021, during the pandemic, the prevalence was 72.4% (75.0% in women and 69.6% in men), and although there was a decrease of 3% in the general population and almost 2% among

women⁽⁹⁾, the percentages are still high. Among college students, higher combined prevalences of overweight and obesity have been reported in men (42.9% to 45.75%) than in women (36.27% to 37.2%), respectively^(6,10), while other studies have reported overweight prevalences of 41.1% in women⁽¹¹⁾. Thus, excess weight continues to be a public health problem, especially among university students, and this is largely determined by inadequate health behaviours.

EVS are related not only to physical health but also to psychological factors that influence mental health, such as psychological well-being^(11,12) and the self-regulation of eating habits⁽¹³⁾, which are central components of the change process towards healthier lifestyles.

However, the study of EVS has prioritized food, exercise and substance use, leaving aside the exploration of other dimensions such as health responsibility, social support, stress management and appreciation for life⁽⁵⁻⁷⁾. This may be especially related to the limited availability of instruments that allow their comprehensive evaluation.

In Mexico, there are five instruments: the *FANTASTIC lifestyle checklist*⁽¹⁴⁾, the Instrument to Measure the Lifestyle of Diabetics⁽¹⁵⁾, the Instrument to Evaluate the Lifestyle of Mexican Adolescents⁽¹⁶⁾, the *Health-Promoting Lifestyle Profile-II*⁽¹⁷⁾ and the Healthy Lifestyle Scale for University Students (EEVSUV)^(18,19). However, only the last two have been validated in university students, and none have compared men and women because there are cultural and behavioural components that could foresee differences in the way the construct is measured.

The *Health-Promoting Lifestyle Profile-II* has six dimensions and 46 items that explain 49.9% of the variance⁽¹⁷⁾. However, the validation procedures have some limitations: they do not consider that the scale was created for adults 18 to 92 years of age, the process of translation into Spanish or the cultural adaptation for the Mexican population, including students in upper and upper secondary education; these students are socially, educationally and psychologically different, and in terms of the results, these procedures present inadequate adjustment indices of inadequate magnitude (e.g., RMSEA = 0.08), keep items with low factorial load (0.273), estimate reliability using only Cronbach's alpha coefficient without considering confidence intervals and not performing an analysis of measurement invariance by sex⁽¹⁷⁾.

For its part, the EEVSEU was created for Chinese university students from Pender's theoretical model of health promotion and contains 38 items distributed across eight dimensions⁽¹⁹⁾. This scale was translated into Spanish and adapted for female Mexican university students⁽¹⁸⁾. Subsequently, the original model was evaluated under a confirmatory factor analysis (CFA), and when it did not receive support, an exploratory factor analysis (EFA) was performed. Then, after successive EFAs, a new model was proposed with 14 items distributed across four dimensions that explain 64.4% of the variance⁽¹⁸⁾; thus, this version of the EEVSEU has better psychometric support, seems to be a more promising scale for use in the Mexican population, and has already been used in previous research in the population of interest, presenting adequate levels of measurement^(6,11).

Therefore, the main objective of this research was to determine the psychometric properties of the EEVSEU in male and female Mexican university students.

MATERIALS AND METHODS

This is a cross-sectional, instrumental study to review the psychometric properties of the EEVSEV.

Participants

A total of 472 students from Mexican public universities participated, with a mean age of 21.4 (SD = 3.4 years), of whom 57.4% were women. Most of the students lived in Veracruz (56.0%), Puebla (12.0%) and Mexico City (10.0%), followed by the rest of the states in the Mexican Republic. A total of 94.0% of the participants reported being single, and 72.0% did not work; they were in the fifth semester of their college careers. Most of the participants were majoring in a health-related academic area (65.5%).

Instruments

The EEVSEU⁽¹⁹⁾ was used in its extensive version translated into Spanish and culturally adapted for Mexican university students⁽¹⁸⁾. It contained 38 items measured on a five-point Likert scale (never, rarely, sometimes, generally and always), distributed across eight dimensions: physical exercise, regular behaviour, nutritional behaviour, health risk behaviour, responsibility in health, social support, stress management and appreciation for life⁽¹⁸⁾.

The Self-Regulation Scale of Eating Habits, created and validated in the Mexican population, was also used⁽¹³⁾. This scale is made up of 14 items measured on a five-point Likert scale (always, almost always, regularly, almost never, never), grouped in three dimensions: self-reaction, self-observation and self-evaluation⁽¹³⁾. The Mexican version of the Psychological Well-being Scale⁽²⁰⁾, which assesses psychological well-being in a unidimensional way, was administered; this scale has 19 items measured on a six-point Likert scale (totally agree, agree, more or less agree, plus or less disagree, disagree and totally disagree)⁽¹²⁾.

Procedure

A pilot study was conducted with 26 university students from Veracruz ($M_{age} = 22.7$ years) online to detect clarity problems in the items. After this study, changes to the wording were deemed unnecessary. The questionnaire was developed on the Google Forms platform. The data collection was performed between February and May 2021 following an open call for participants in student groups on the social network Facebook.

Ethical considerations

The requirements established by the Declaration of Helsinki in 1975 were met. The study was approved by the Research Ethics Committee of the Public Health Institute of Veracruzana University and assigned the identification of CEI-ISP-R04/2020 registry. The students read an informed consent prior to the application of the scale, which indicated that their participation was voluntary.

Data analysis

Three measurement models were evaluated: the original model, consisting of 38 items and 8 dimensions (M1)⁽¹⁹⁾, the model obtained in Mexican women, composed of 14 items and 4 dimensions (M2)⁽¹⁸⁾, and the resulting model of this work (M3). A CFA was performed in the measurement models through the WLSMV estimation method with polychoric matrices because the items of the EEVSEU are ordinal measurements. The following goodness-of-fit indices were considered: CFI (≥ 0.90), RMSEA (≤ 0.05) and WRMR (≤ 1.00), as well as the magnitude of factorial loads (≥ 0.50)²¹. The analyses were carried out with the program Mplus v7.0.

Subsequently, the measurement invariance of the EEVSEU between men and women was analysed by means of a multiple group factorial analysis. Initially, the configural invariance (internal structure), metric (factorial loads), strength (thresholds) and strict (residuals) were evaluated, where a nonsignificant change was expected in the CFI ($\Delta\text{CFI} \leq -0.01$) and RMSEA ($\Delta\text{RMSEA} \leq 0.015$), which means that the first change should not decrease more than 0.01, and that the second should not increase more than 0.015⁽²²⁾.

Then, the reliability of the scores was estimated using the α coefficient and its 95% CI (≥ 0.70) and the reliability of the construct with the omega coefficient (≥ 0.60)^(21,23). Finally, the Pearson correlation coefficient was calculated, with an association of 0.20–0.50 considered low, 0.50–0.80 moderate, and > 0.80 high⁽²⁴⁾. Analyses were conducted in SPSS, version 18.0, due to the normal distribution of the data.

RESULTS

When analysing the goodness-of-fit indices of the first two measurement models in men and women (separately), it was found that M1 presented an adequate fit in women (CFI = 0.923; RMSEA = 0.050, CI 90% [0.044-0.055]; WRMR = 1.158) but not in men (CFI = 0.890; RMSEA = 0.057, CI 90% [0.051-0.063]; WRMR = 1.176). With respect to M2, a good fit was obtained in the group of women (CFI = 0.961; RMSEA = 0.080, CI 90% [0.066-0.093]; WRMR = 0.983), showing acceptable factor loadings (Table 1), but in the group of men, no results were obtained because the model presented estimation problems associated with items 13 (Drinking alcohol in excess) and 14 (Smoking or consuming tobacco or marijuana), so it did not receive support in that group.

Therefore, in M1, the items related to health risk behaviours (CRPS; items 13, 14, 15 and 16) showed difficulties. First, items 15 (Listen with headphones continuously for more than 30 minutes) and 16 (Use the computer continuously for more than one hour) presented low factorial loads ($\lambda < 0.50$). In turn, items 13 (Drinking excess alcohol) and 14 (Smoking or consuming tobacco or marijuana) presented negative factor loads in men and positive factor loads in women (Table 1). Thus, the CRPS dimension was excluded from the analysis.

In this sense, a new model was conceived that considers all the dimensions of the original model except dimension CRPS (M3), which showed an acceptable fit in both men (CFI = 0.893; RMSEA = 0.063, CI 90% [0.056-0.069]; WRMR = 1.175) and women (CFI = 0.928; RMSEA = 0.053, CI 90% [0.048-0.059]; WRMR = 1.132),

although Item 4 (Perform vigorous exercise 30 minutes after eating) and Item 26 (Talk to others about my problems) also presented inappropriate factorials ($\lambda \leq 0.50$) (Table 1).

Table 1: Factor loadings of each item by measurement model in men and women

Item	M1		M3		M2	
	$\lambda - H$	$\lambda - M$	$\lambda - H$	$\lambda - M$	$\lambda - H$	$\lambda - M$
F1 - M1 and M3: exercise behaviour						
1	0.883	0.808	0.885	0.807		
2	0.757	0.811	0.757	0.811		
3	0.738	0.758	0.736	0.758		
4	0.443	0.436	0.442	0.436		
F2 - M1 and M3: regular behaviour						
5	0.705	0.658	0.705	0.658		
6	0.799	0.659	0.799	0.662		
7	0.898	0.924	0.897	0.921		
8	0.607	0.671	0.607	0.671		
F3 - M1 and M3: nutritional behaviour						
9	0.814	0.810	0.817	0.812		
10	0.670	0.631	0.667	0.630		
11	0.647	0.693	0.645	0.693		
12	0.626	0.595	0.628	0.594		
F4 - M1: health risk behaviours						
13	-0.816	0.830	-	-		
14	-0.485	0.901	-	-		
15	0.350	0.312	-	-		
16	0.483	0.408	-	-		
F5 - M1 and M3: health responsibility						
17	0.442	0.633	0.444	0.631		
18	0.550	0.615	0.548	0.614		
19	0.529	0.457	0.531	0.458		
20	0.572	0.684	0.575	0.690		
21	0.616	0.507	0.615	0.507		
22	0.548	0.393	0.545	0.389		
F6 - M1 and M3: social support						
23	0.595	0.680	0.589	0.682		
24	0.585	0.652	0.590	0.648		
25	0.617	0.657	0.619	0.655		
26	0.564	0.418	0.565	0.419		
27	0.624	0.603	0.620	0.604		
28	0.647	0.540	0.649	0.541		
F7 - M1 and M3: stress management						
29	0.600	0.653	0.599	0.654		
30	0.468	0.614	0.468	0.615		
31	0.580	0.577	0.580	0.579		
32	0.735	0.744	0.735	0.739		
33	0.681	0.752	0.682	0.752		
F8 - M1 and M3: appreciation for life						
34	0.781	0.680	0.781	0.685		
35	0.762	0.731	0.762	0.725		
36	0.772	0.864	0.772	0.864		
37	0.891	0.890	0.891	0.892		
38	0.773	0.784	0.773	0.781		

F1 - M2: substance use			
13		NE	0.886
14		NE	0.903
F2 - M2: appreciation for life			
34		NE	0.644
35		NE	0.697
36		NE	0.878
37		NE	0.910
38		NE	0.775
F3 - M2: interpersonal relationships			
23		NE	0.699
27		NE	0.648
28		NE	0.518
F4 - M2: eating, study and rest patterns			
6		NE	0.504
7		NE	0.897
8		NE	0.624
32		NE	0.769

λ : factorial load; H: men; M: women; M1: measurement Model 1; M2: measurement Model 2; M3: measurement Model 3; NE: not estimated.

After this, favourable evidence of measurement invariance was obtained in relation to M3 (Table 2).

Table 2: Measurement invariance with respect to gender

	CFI	Δ CFI	RMSEA	Δ RMSEA
Configural	0.912		0.058	
Metric	0.925	0.013	0.053	-0.005
Strong	0.915	-0.01	0.054	0.001
Strict	0.918	0.003	0.052	-0.002

RMSEA: mean square error of approximation; CFI: comparative adjustment index; Δ : variation.

Then, considering that M3 is invariant between men and women, the group was analysed jointly, obtaining adequate fit indices (CFI = 0.912; RMSEA = 0.059, CI 90% 0.055, 0.062; WRMR = 1.385) and acceptable factor loadings in most cases, as well as adequate reliability coefficients.

Regarding the reliability of the scores, in most cases, an acceptable magnitude was found, except in health responsibility. With respect to the reliability of the construct, in all cases the magnitudes were adequate (Table 3).

Table 3: Factor loadings and reliability of M3 in the total sample

Items	F1	F2	F3	F4	F5	F6	F7
F1: exercise behaviour							
1	0.842						
2	0.787						
3	0.746						
4	0.445						
F2: regular behaviour							
5		0.679					
6		0.719					
7		0.909					
8		0.645					
F3: nutritional behaviour							
9			0.813				
10			0.642				
11			0.657				
12			0.600				
F4: health responsibility							
17				0.553			
18				0.597			
19				0.494			
20				0.631			
21				0.547			
22				0.467			
F5: social support							
23					0.639		
24					0.611		
25					0.644		
26					0.493		
27					0.615		
28					0.575		
F6: stress management							
29						0.632	
30						0.543	
31						0.585	
32						0.746	
33						0.729	
F7: appreciation for life							
34							0.726
35							0.742
36							0.820
37							0.895
38							0.770
F1	1						
F2	0.350	1					
F3	0.768	0.567	1				
F4	0.238	0.474	0.498	1			
F5	0.284	0.403	0.340	0.632	1		
F6	0.413	0.660	0.511	0.482	0.530	1	
F7	0.392	0.544	0.426	0.450	0.544	0.761	1
α	0.749	0.767	0.727	0.576	0.722	0.734	0.843
ω	0.806	0.830	0.775	0.721	0.769	0.785	0.894

Finally, associations are observed between the dimensions of the EEVSEU and psychological well-being and self-regulation of eating habits, although to a lesser degree with the self-assessment dimension (Table 4).

Table 4: Correlations between healthy lifestyles, psychological well-being and self-regulation of eating habits

Healthy lifestyles	Psychological well-being	Self-regulation of eating habits		
		Self-assessment	Self-observation	Self-reaction
Exercise behaviour	0.305	0.209	0.324	0.457
Regular behaviour	0.431	<i>0.111</i>	0.285	0.382
Nutritional behaviour	0.335	0.274	0.484	0.621
Health responsibility	0.272	<i>0.131</i>	0.280	0.312
Social support	0.383	<i>0.141</i>	0.233	0.339
Stress management	0.500	<i>0.087</i>	0.343	0.431
Appreciation for life	0.716	<i>0.110</i>	0.370	0.434
Instrument	0.642	0.210	0.486	0.635

Note. In italics: nonsignificant correlations (<.20)

DISCUSSION

The EEVSEU shows adequate psychometric properties for its use in the Mexican university population, which will allow us to strengthen the research in this group and, above all, the implementation and improvement of strategies for the promotion of EVS to improve health.

This version is shorter than the original model since when eliminating the dimension of health risk behaviours due to inadequate adjustment, four items are lost. This loss of items was also observed in the Iranian version due to low factor loadings of items 15 and 16, in addition to low reliability values of the scores^(19,25). In the Mexican version, these items were also eliminated⁽¹⁸⁾. These two items are related to negative health effects^(26,27); however, the processes derived from the COVID-19 pandemic may be related to its loss, since both are directed to behaviours closely linked to the modality of online classes and distance learning (Item 15: Listen with headphones continuously for more than 30 minutes; Item 16: Use the computer continuously for more than one hour). Therefore, it is probable that the psychometric behaviour of these items originates because what could be considered an unhealthy behaviour before the pandemic is currently valued as a tool to access education.

Items 13 and 14 (drinking alcohol in excess and smoking or consuming tobacco or marijuana, respectively) also belong to the eliminated dimension; although they are behaviours directly related to EVS, there are other questionnaires available for their measurement⁽²⁸⁻³⁰⁾ that can be used in conjunction with this questionnaire to study and explain in greater depth the VE of Mexican university students.

The analysis of measurement invariance with respect to sex has not been reported in previous research^(17-19,25), which represents one of the main strengths of this research. This measurement model offers the possibility of use as a standardized tool to measure the EVs of both female and male Mexican university students and make fair comparisons that reflect the differences or similarities between the sexes.

Finally, the relationship of the EVS to psychological well-being and the self-regulation of eating habits provides greater theoretical support to the measurement model proposed in this research; it seems that high scores of psychological well-being and self-regulation help the development, consolidation and maintenance of EVS or vice versa^(6,11).

However, and despite these strengths, there are limitations to this study. One of the main limitations is that only young university students participated. In Mexico, many younger people are engaged in the formal and informal labour market, which is why subsequent studies should consider their inclusion.

Finally, the scale used in this research should be applied to other variables and adapted for other population groups, especially young people who are not students or the general population.

CONCLUSIONS

This study's findings provide a comprehensive proposal for measuring EVS in a standardized way to objectively measure variables of interest. These results have potential implications for nursing research, health education interventions and disease prevention, as well as follow-up measures to gauge the recovery process of the health service user.

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ISSN 1695-6141

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