# Measurement of Ageism in Mexican University Students: Psychometric Properties of the Negative Stereotypes Questionnaire towards Old Age

Medición del ageísmo en universitarios mexicanos: propiedades psicométricas del Cuestionario de Estereotipos Negativos hacia la Vejez

Medição do ageísmo em universitários mexicanos: propriedades psicométricas do Questionário de Estereótipos Negativos em Relação à Velhice

José René Blanco Ornelas, Dr.<sup>1</sup> Susana Ivonne Aguirre Vásquez, Dra.<sup>1</sup> Ana Citlalli Díaz-Leal, Dra.<sup>2</sup> Perla Jannet Jurado-García, Dra.<sup>1\*</sup>

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- 1 Faculty of Physical Culture Sciences, Autonomous University of Chihuahua, Chihuahua, Mexico.
- 2 OPD Hospital Civil de Guadalajara, Universidad de Guadalajara, México.

José René Blanco Ornelas, ORCID: http://orcid.org/0000-0003-2204-260X Susana Ivonne Aguirre Vásquez, ORCID: http://orcid.org/0000-0001-8878-2120 Ana Citlalli Díaz-Leal, ORCID: https://orcid.org/0000-0002-9442-073X Perla Jannet Jurado-García, ORCID: http://orcid.org/0000-0002-0917-0028

\* Correspondence author: pjurado@uach.mx

#### Abstract

*Introduction*: The study aims to investigate the psychometric properties proposed for the Questionnaire on Negative Stereotypes Towards Old Age (CENVE). *Materials and methods:* The total sample comprised 1,480 participants, all of whom were students of the Physical Education and Human Motricity degree program at the Autonomous University of Chihuahua (Mexico), with a mean age of 21.53 years (sD = 1.84) for women and 20.90 years (sD = 2.05) for men. Psychometric analysis showed that a one-factor structure was viable and appropriate. *Results*: The factorial structure of the questionnaire was analyzed using confirmatory factor analysis. The single-factor structure (stereotypes towards old age), based on substantive and statistical criteria, demonstrated adequate reliability and validity indicators. *Discussion:* The confirmatory factor analyses performed support a single-factor structure, demonstrating adequate internal consistency, while the factor obtained presents overall satisfactory standardized factor loadings.

Keywords: ageism; factor structure; construct validation; structural equation.

#### Resumen

*Introducción*: el estudio pretendió indagar si se replican los resultados psicométricos propuestos para el Cuestionario de Estereotipos Negativos hacia la Vejez (CENVE). *Materiales y método*: la muestra total fue de 1480 alumnos de las licenciaturas de Educación Física y Motricidad Humana que se ofrecen en la Universidad Autónoma de Chihuahua (México), con una edad media de 20.53 años (DE = 1.84) para las mujeres y de 20.90 (DE = 2.05) para los hombres. La estructura factorial del cuestionario se evaluó a través de análisis factoriales confirmatorios. *Resultados*: los análisis muestran que una estructura unifactorial es viable y adecuada. La estructura de un solo factor general (estereotipos hacia la vejez), atendiendo a criterios estadísticos y sustantivos, ha mostrado adecuados indicadores de ajuste de fiabilidad y validez. *Discusión*: los análisis factoriales confirmatorios realizados apoyan una estructura monofactorial y demuestran una consistencia interna adecuada; mientras que el factor obtenido presenta cargas factoriales estandarizadas globalmente satisfactorias.

Palabras clave: ageísmo; estructura factorial; validación de constructo; ecuaciones estructurales.

#### Resumo

*Introdução*: o estudo tem como objetivo verificar se os resultados psicométricos propostos para o Questionário de Estereótipos Negativos em Relação à Velhice são replicados. *Materiais e métodos*: a amostra total consistiu em 1480 alunos dos cursos de Educação Física e Motricidade Humana da Universidade Autónoma de Chihuahua (México), com uma média de idade de 20.53 anos (DP = 1.84) para o sexo feminino e 20.90 anos (DP = 2.05) para o sex masculino. A estrutura fatorial do questionário foi analisada por meio da análise fatorial confirmatória. *Resultados*: as análises mostraram que uma estrutura unifatorial é viável e adequada. A estrutura de um único fator geral (estereótipos em relação à velhice), com base em critérios estatísticos e substanciais, demonstrou indicadores adequados de ajuste, confiabilidade e validade. *Discussão*: as análises fatoriais confirmatórias realizadas apoiam uma estrutura de fator único, demonstrando uma consistência interna adequada, enquanto o fator obtido apresenta cargas fatoriais padronizadas satisfatórias em geral.

Palavras-chave: ageísmo; estrutura fatorial; validação de construto; equações estruturais.

## Introduction

A ging is a multifactorial phenomenon involving physical, cognitive, and psychosocial changes. Genetic factors, lifestyle, economic, social, and political aspects, as well as gender, are key determinants influencing people's health and the aging process (1-5). The aging process varies among individuals; functional deterioration does not occur in the same way for everyone (6). Old age is often associated with the onset of diseases, frailty, and disability (7).

Society's perception of older adults and aging is based on a series of myths and stereotypes that are far from reality and influence attitudes and behaviors. Stereotypes are pejorative, biased, and exaggerated conceptions involving affective, evaluative, and behavioral components. These beliefs rely on simplistic generalizations that overlook individual characteristics and lead to discriminatory behaviors toward older adults, associating them with loss of abilities, deterioration, and illness (8-10).

Older adults experience discrimination in various areas, such as healthcare and employment (11). These negative and derogatory perceptions of aging contribute to the decline of older individuals at chronological, biological, psychological, sociological, and community levels, significantly affecting their physical and mental well-being (12-16).

When negative stereotypes are internalized, they can create self-fulfilling prophecies, fostering weakness and dependency (17,18). Stereotypes about aging have been shown to predict health status, disease progression, and other behavioral outcomes in adulthood (19). In essence, internalizing a negative self-image can lead older adults to develop prejudices against themselves, resulting in low self-esteem, shame, depression, and, in extreme cases, suicide (20). Self-perceived worthlessness is associated with increased mortality risk, with this relationship being stronger in men than in women and persisting into very advanced ages (21).

The study of stereotypes is relevant due to its practical implications. Beliefs about aging can result in exaggerated or biased perceptions that influence the attitudes and behaviors of various groups, including young people, family members, caregivers, and healthcare professionals (7,22).

According to Smith and Bergeron, limited interaction with older adults can lead to high levels of ageism, causing young people to adopt harmful attitudes, discriminatory behaviors, and institutional practices that reinforce stereotypical beliefs about aging (23). Therefore, during higher education, it is essential to reduce negative stereotypes toward aging among future professionals who will be responsible for the care of individuals in the final stages of life (24). Strengthening knowledge and training on aging can help minimize stereotypical beliefs (25).

Given these considerations, the present study, classified as an instrumental study, aims to provide empirical support for the factorial structure of the Negative Stereotypes Towards Old

Age Questionnaire (CENVE) proposed by Mena et al. (1,26). This research is justified by the need to validate the factor structure of the instrument and assess its psychometric equivalence across different groups. In intergroup comparisons, it is essential to adapt psychological measurement tools to meet equivalence criteria and determine whether the same factorial structure applies to different participant groups or, more broadly, to diverse populations (27).

# Materials and methods

#### Participants

The sample consisted of a total of 1,480 university students, 750 (50.7%) women and 730 (49.3%) men. Female participants' ages ranged from 18 to 28 years, with a mean of 20.53 years and a standard deviation of 1.84 years. Male participants' ages ranged from 18 to 28 years, with a mean of 20.90 years and a standard deviation of 2.05 years. The sample was obtained through convenience sampling, ensuring representation from different semesters of the degree programs offered at the Faculty of Physical Culture Sciences of the Autonomous University of Chihuahua (Mexico).

#### Instrument

The Negative Stereotypes towards Old Age Questionnaire (CENVE) by Mena et al. is a Likerttype scale, with 15 items designed to assess prejudice towards old age (1); participants respond, on a scale of 1 to 4 (1 = strongly disagree, 2 = somewhat disagree, 3 = somewhat agree and 4 = strongly agree) according to his or her level of agreement with each of the proposed aspects. The questionnaire items are grouped into three factors: Health, level of negative stereotype referring to physical and mental health (items 1, 4, 7, 10 and 13); motivational-social, level of negative stereotypes referring to aspects of motivation and interpersonal relationships (items 2, 5, 8, 11 and 14); character-personality, level of stereotypes referring to character-personality (items 3, 6, 9, 12 and 15).

For our study, the following adaptations were made: While the original scale uses four response options, in the version used in the present study, participants chose from eleven possible options on a scale from 0 to 10. This adaptation was justified because Mexican participants are accustomed to a 0-to-10 scale (0 = completely disagree, 1 to 3 = disagree, 4 to 6 = sometimes false, sometimes true, 7 to 9 = agree, and 10 = completely agree), as this is the grading system used in the Mexican educational system. Viciana et al. reported a similar modification when validating a scale with the Spanish population (28).

The second adaptation involved digitizing the questionnaire using software designed by Blanco et al. (29). This adaptation aimed to facilitate the administration and data processing of the questionnaire, improving the speed and efficiency of these procedures.

#### Procedure

The Scientific Committee of the Department of Research and Postgraduate Studies approved the research protocol at the Faculty of Physical Culture Sciences of the Autonomous University of Chihuahua. Additionally, this research complied with the guidelines of the General Health Law of Mexico on Health Research. Students enrolled in bachelor's degree programs at the Faculty of Physical Culture Sciences of the Autonomous University of Chihuahua were invited to participate in the study. Those who agreed to participate signed an informed consent form. Participants then completed the instrument described above using a personal computer (administrator module of the editor for typical execution scales) in a single session of approximately 20 minutes at the Faculty of Physical Culture Sciences computer labs. At the beginning of each session, a brief introduction was provided regarding the importance of the research and how to access the instrument. Participants were encouraged to answer sincerely, and confidentiality of the collected data was ensured. Instructions on how to respond appeared on the first screens, before the first item of the instrument. At the end of the session, participants were thanked for their involvement. Once the instrument was completed, the results were collected using the results generator module of the Scale Editor, version 2.0 (29).

#### Data analyses

The first step in analyzing the psychometric properties of the questionnaire involved calculating the mean, standard deviation, skewness, kurtosis, and discrimination indices for each item. Items with extreme values of skewness or kurtosis, or with a discrimination index below .35, were subsequently removed from the scale.

Subsequently, two measurement models were compared: Model 1 (CENVE-3), a three-factor model according to the original distribution of the items within the questionnaire, and Model 2 (CENVE-1), which corresponds to a single-factor model, deleting items that were not sufficiently well explained.

To perform the confirmatory factor analyses, SPSS Amos 21 software (30) was used. The variances of the error terms were specified as free parameters, and one structural coefficient per latent variable (factor) was set to one, ensuring that its scale matched that of one of the observable variables (items). The maximum likelihood estimation method was applied, following Thompson's recommendation that confirmatory factor analysis should not only

verify the fit of a theoretical model but also compare the fit indices of multiple alternative models to select the most suitable one (31).

To assess the model's fit, the Chi-square statistic, the goodness of fit index (GFI) and the mean square error of approximation (RMSEA) were used as absolute measures of fit. The Adjusted Goodness Index (AGFI), the Tucker-Lewis Index (TLI), and the Comparative Goodness-of-Fit Index (CFI) were used as measures of incremental fit. The Chi-square to degrees of freedom ratio (CMIN/DF) and the Akaike Information Criterion (AIC) were used as parsimony adjustment measures (32,33).

Finally, the reliability of each dimension was calculated based on the measurement models obtained, using Cronbach's Alpha Coefficient (34,35) and the Omega Coefficient (36,37).

### Results

### Descriptive analyses and discrimination indices

Table 1 summarizes the results of the descriptive analyses and the discrimination indices (corrected item-total correlation) for each of the 15 questionnaire items in the total sample. The mean scores for all items range between 4.71 and 6.95, with standard deviations consistently above 2.00 (within a response range of 0 to 10). All skewness and kurtosis values fall within the  $\pm 1.0$  range, indicating that the variables reasonably conform to a normal distribution. Regarding the discrimination indices, all items exhibit satisfactory discrimination, with indices exceeding .35 (38).

Item	М	SD	SK	KU	<b>r</b> <sub>i-total</sub>
Item 1	6.29	2.22	67	.37	.48
Item 2	6.22	2.42	54	.07	.38
Item 3	5.86	2.23	51	.25	.58
Item 4	5.32	2.32	39	10	.61
Item 5	4.71	2.65	14	72	.46
Item 6	5.79	2.33	44	.05	.59
Item 7	5.78	2.04	55	.58	.51
Item 8	5.28	2.44	43	30	.60
Item 9	6.95	2.16	65	.37	.39
Item 10	5.76	2.19	55	.32	.67
	-				

**Table 1.** Descriptive analysis and discrimination indices of the items of the Negative Stereotypes towards Old AgeQuestionnaire

Continues

Item	М	SD	SK	KU	r <sub>i-total</sub>
Item 11	5.44	2.23	50	.05	.64
Item 12	5.30	2.34	45	03	.54
Item 13	6.66	2.24	68	.46	.47
Item 14	5.30	2.50	34	27	.49
Item 15	5.77	2.01	42	.63	.63

м: mean; sd: standard deviation; sк: Skew; кu: kurtosis;  $r_{i-total}$ : corrected item-total correlation.

#### Confirmatory factor analyses

The overall results of the confirmatory factor analysis (GFI = .938; RMSEA = .069; CFI = .910) for the CENVE-3 model, which aligns with the original item distribution of the negative stereo-types towards old age questionnaire (CENVE), suggest that the measurement model is barely acceptable (Table 2).

Table 2. Fit indices for the CENVE-3 Y CENVE-1 models

Modelo	Absolute indices		Incremental indices			Parsimony indices		
	$\chi^2$	GFI	RMSEA	AGFI	TLI	CFI	CMIN/DF	AIC
cenve-3	682.551*	.938	.069	.915	.892	.910	7.960	758.551
CENVE-1	25.135*	.995	.029	.988	.991	.995	2.285	59.135

\*p < .05.

The three factors of the CENVE-3 model collectively explain approximately 52% of the variance. However, 7 of the 15 items load below .60 in their expected dimension (Table 3). Additionally, the presence of extremely high intercorrelations between the three factors suggests poor discriminant validity among them (Table 3), indicating the possibility of a single-factor model.

**Table 3.** Factor loadings and correlations for the CENVE-3 model

Item		F2	F3
Factor Loadings			
1 Most people, by the time they reach the age of 60, begin having a considerable memory impairment	.52		
4 Most people over the age of 70 have a mental illness serious enough to impair their normal abilities	.67		
7 Most adults maintain an acceptable level of health until the age of approximately 60, when there is a strong deterioration in health	.56		
10 Most people over the age of 60 have a series of disabilities that make them dependent on others			
		<u> </u>	

Continues

Item	F1	F2	F3	
Factor Loadings				
13 Cognitive impairment (memory loss, disorientation, confusion) is an inevitable part of old age	.51			
2 Older people have less interest in sex		.40		
5 Older people have less friends than younger people		.51		
8 As we get older we loose interest in things		.64		
11 As we get older we loose the ability to solve problems that we face		.70		
14 Almost no one over the age of 60 performs as well on a job as someone younger		.55		
3 Older people get irritated easily and are grumpy			.61	
6 As older people age more, they become more rigid and inflexible			.62	
9 Older people are, on many occasions, like children			.41	
12 People's defects become more acute with age			.60	
15 A large part of people above the age of sixty have a marked decrease in their faculties			.67	
Factor Correlations				
F1	-			
F2	.95	-		
F3	.95	1.00	-	

F1: health; F2: motivational-social; F3: personality-character.

The overall results of the confirmatory factor analysis (GFI = .995; RMSEA = .029; CFI = .995) for the second tested model (CENVE-1), which represents a one-dimensional structure of the questionnaire after removing low-loading items, indicate that this measurement model outperforms the previous one, with an optimal fit (Table 2). The single factor in this model accounts for approximately 50% of the variance. Furthermore, as shown in Table 4, none of the items load below .60 in their expected dimension.

Table 4. Factor loadings for the CENVE-1 model

Item	Factor loadings
3 Older people get irritated easily and are grumpy	.60
4 Most people over the age of 70 have a mental illness serious enough to impair their normal capacities	.67
6 As older people age more, they become more rigid and inflexible	.60
8 As we grow older, we lose interest in things	.68
10 Most people over the age of 60 have a series of disabilities that make them more depen- dent on others	.69
12 People's defects become more acute with age	.60
15 A large part of people above the age of sixty have a marked decrease in their faculties	.68

### Factor reliability

The factors obtained in the confirmatory factor analysis for the CENVE-3 model mostly exhibit internal consistency values slightly above .70, indicating a suboptimal level of internal consistency. In contrast, the general factor (Stereotypes Towards Old Age) of the CENVE-1 model achieves internal consistency values exceeding.80, demonstrating a more robust internal consistency (Table 5).

 $\label{eq:table_stability} \textbf{Table 5.} Omega and alpha coefficient for the factors obtained in the confirmatory factor analyses of the CENVE-3 and CENVE-1 models$ 

Factor	Ω	α		
CENVE-3 model				
Health	.740	.741		
Motivational-social	.698	.682		
Character-personality	.721	.714		
CENVE-1 model				
Stereotypes towards old age	.834	.827		

# Discussion

The main goal of this study was to determine whether the psychometric results proposed by Mena et al. (1) for the CENVE could be replicated in a sample of university students using confirmatory factor analyses (CFA). The confirmatory factor analyses performed support a single-factor structure, demonstrating adequate internal consistency, while the factor obtained presents overall satisfactory standardized factor loadings.

In summary, analyzing the psychometric properties of the CENVE in the sample of university students has shown that a one-factor structure is both viable and adequate according to established psychometric criteria. The single-factor structure, considering both statistical and substantive criteria, has shown appropriate indicators of fit, reliability, and validity. However, the scope of these findings remains limited, and future research should replicate the obtained structure to provide more robust evidence regarding the scale's factor structure. Specifically, it is necessary to assess whether the invariance of the scale structure holds across gender, age groups, and students from different academic disciplines. Therefore, further studies are needed to confirm or challenge the data obtained in previous investigations.

Additionally, it is crucial to evaluate whether the scale is useful for examining the relationship between attitudes toward older adults, life satisfaction, and perceived psychological well-being.

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# **Author contribution**

The authors contributed to the conception and design of the research, as well as the planning, acquisition, analysis, and interpretation of the data. As well as the final approval of the manuscript to be published.

# **Conflicts of interest**

The authors declare no conflict of interest.

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