Artículo Original

Psychometric properties of the Coronavirus Anxiety Scale in Mexican adult population

Propiedades psicométricas de la Escala de Ansiedad por Coronavirus en población adulta mexicana

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RESUMEN

Introducción: El desarrollo de instrumentos de medición específicos, confiables y válidos dirigidos a la identificación de los síntomas de ansiedad ante el SARS-CoV-2 es una necesidad urgente en materia de salud mental en el contexto de la pandemia por Covid-19. **Objetivo**: Adaptar la Coronavirus Anxiety Scale (CAS) e identificar sus propiedades psicométricas en población adulta mexicana. **Métodos:** Estudio instrumental de adaptación, validación e identificación de propiedades psicométricas en una muestra intencional, no probabilística, conformada por 1070 adultos mexicanos. **Resultados**: Se encontró una estructura unidimensional de cuatro ítems, con confiabilidad aceptable (α = .792; ω = .868). Asimismo, los baremos por sexo y sintomatología de Covid-19 mostraron precisión diagnóstica sólida (sensibilidad del 91% y especificidad de 96.9%). **Conclusión:** La versión en español de cuatro ítems de la Coronavirus Anxiety Scale (CAS-4SP) es una medida breve, confiable y válida que puede emplearse en contextos clínicos y de investigación en población mexicana.

Palabras clave: Pandemias; Infecciones por Coronavirus; Psicometría; Estudio de Validación

SUMMARY

Introduction: The development of specific, reliable, and valid measurement instruments aimed at identifying symptoms of anxiety, in the face of SARS-CoV-2, has become an urgent need in mental health in the context of the Covid-19 pandemic. **Objective:** To adapt the Coronavirus Anxiety Scale (CAS) and identify its psychometric properties for the Mexican adult population. **Methods:** Instrumental study of adaptation, validation, and identification of psychometric properties in an intentional, non-probabilistic sample, made up of 1,070 Mexican adults. **Results:** An unidimensional structure of four items was found, with acceptable reliability (α = .792; ω = .868). Likewise, the cut scores by sex and symptoms of Covid-19 showed solid diagnostic precision (91% sensitivity and 96.9% specificity). **Conclusion:** The four-item Spanish version of the Coronavirus Anxiety Scale (CAS-4SP) is a short, reliable, and valid measure for clinical and research contexts in the Mexican population.

Keywords: Pandemics; Coronavirus Infections; Psychometrics; Validation Study

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Introduction

The World Health Organization (WHO) points out that anxiety disorders are among the most common mental health problems worldwide. By 2015, approximately 300 million people, 3.6% of the world population (4.6% of women, and 2.6% of men) were diagnosed with an anxiety disorder, which implies an estimated prevalence of 12% in primary health care and represented 24.6 million years lived with disability. Hence, anxiety-related mental disorders are the sixth leading cause of loss of wellness and function. In Mexico, it is a very common circumstance. It is calculated that at least 4,281,809 people, mainly adults of productive age, live with dysfunctional levels of anxiety, this implies that 3.6% of the Mexican population suffers from an anxiety disorder (1, 2).

Anxiety is an adaptive and natural emotional state that alerts us to pay attention and avoid possible dangers. It is characterized by unpleasant, brief, occasional, and mild symptoms, both somatic and cognitive. Symptoms may include muscle tension, stomach pain, dizziness, nausea, changes in appetite, sensation of shortness of breath, sweating, tremor, headache, fainting, tachycardia, sleep problems, recurrent intrusive worries, irritability, lack of concentration, feeling nervous, and others. With an anxiety disorder, physiological and cognitive symptoms appear disproportionate and with greater frequency, intensity and duration, so the discomfort is clinically significant and hinders the functioning of the affected person in various areas of their life (3-10).

Under normal conditions, mental health problems associated with anxiety are highly prevalent. But in critical situations such as emerging infections, like the Covid-19 epidemic outbreak, the clinically significant anxiety responses present an important increase. This is because we are facing a health, ecological, and humanitarian crisis that not only threatens the physical health of all human beings, but also alters behavior, lifestyles, daily life, and social interactions. Previous data and recent research carried out in various countries, including Mexico, show that emotional responses, such as fear and anxiety, in the general and specific population, present a high level and an upward trend before, during, and after the emergency (11-29).

Given this scenario, it is urgent to design brief, sensitive, specific, reliable, and valid assessment tools that facilitate the identification of somatic symptoms related to emotional responses of fear and anxiety in the face of the coronavirus pandemic and that contribute to the differentiation of these symptoms and others clinical pictures and presentations, not necessarily associated with the crisis. In addition, the development of these tools enables timely detection, referral, treatment, and monitoring, as well as the estimation of the proportion of the affected population that contributes to the creation of policies, planning, and evaluation in the area of mental health. However, given that the Covid-19 pandemic is an unforeseen event, the development of these tools is, for now, scarce (1, 30-32).

One of the first measurement instruments designed to assess pandemic anxiety was the Coronavirus Anxiety Scale (CAS) developed and validated for American residents of diverse ethnic origins. CAS consists of five items that measure physiological anxiety derived from exposure to information and/or thoughts about the new coronavirus. It has a reliable one-dimensional structure (α = .93), without variations due to gender, ethnic origin, or age. Moreover, it has correlated with the diagnosis of coronavirus, functional impairment associated with anxiety, coping through substance use and religion, hopelessness, suicidal ideation, as well as attitudes towards the president of the United States of America and products of Chinese origin. Besides, the scale has adequate properties (90% sensitivity and 85% specificity) for detection and classification with a cutoff point ≥9 (30).

In a subsequent study (31), the psychometric properties obtained were very similar to those of the original study (α = .92) and the initial cutoff point was preserved to differentiate individuals with and without dysfunctional anxiety (76% sensitivity and 90% of specificity). Additionally,

the scale has been adapted and validated for the Polish population. The structure of five single factor items was replicated with adequate reliability (α = .86) and correlations were identified with quarantine due to exposure to coronavirus, collection of diagnostic tests, and the time of evaluation, while age, sex or education did not correlate with the level of anxiety due to coronavirus (33). In the same way, the scale was adapted and validated for the Turkish population. It demonstrated adequate psychometric properties (α = .80) and positive correlations with the scores obtained in the Obsession with COVID-19 Scale (OCS) and the Fear of COVID-19 Scale (FCV-19S) (34).

Another instrument that measures the emotional responses of fear and anxiety regarding coronavirus is the Fear of COVID-19 Scale (FCV-19S). It was designed for the Iranian population (35); adapted and validated for the Israeli people (36), Turkish citizens (37), and Russian and Belarusian residents (38). Other are the COVID-19 Anxiety Scale (also known as CAS) for the Indian population (39); the COVID-19 Anxiety Syndrome Scale (C-19ASS) for the United States residents (40); the Corona Disease Anxiety Scale (CDAS) for the Iranian population (41) and the COVID-19 Phobia Scale (C19P-S) to measure phobia of coronavirus (42) in the Turkish citizens (43). The psychometric properties of pre-existing scales have also been analyzed in the context of Covid-19, such is the case of the Zung Self-Rating Anxiety Scale (SAS), adapted and validated for the Spanish population (44).

The psychometric properties of the previous scales are adequate. Nevertheless, it is believed that the inclusion of cognitive symptoms of anxiety and in some cases, the extension of the tests, do not help primary care physicians to identify and differentiate between somatic symptoms of coronavirus anxiety and other clinical conditions. This is an extremely important aspect in the context of the Covid-19 pandemic, both to avoid saturation of health services and to provide effective mental health care (30, 31). However, this scale does not have valid versions for Mexican population. Hence, the objective of the present study is to adapt to the Coronavirus Anxiety Scale (CAS) and identify its psychometric properties for the Mexican adult population.

Material and Methods
Design
Instrumental study of adaptation, validation, and identification of psychometric properties (45-53).
Participants
Two groups were considered. The review group for the scale translation proposal and content validation by judges consisted of 10 experts, two men (20%) and eight women (80%), aged between 32 and 44 years (M = 37.1; SD = 3.63). Eight of them (80%) reported being physicians with public and / or private practice in the first level of care and with more than two years of experience in general external consultation (M = 9.125; SD = 5.743). Also participating was an expert in clinical psychology with eleven years of experience and an English language expert with three years of experience and residence abroad. All mentioned Spanish as their native language and English as a foreign language. Likewise, six non-expert judges participated, three men (50%) and three women (50%), residents of the State of Mexico, whose ages ranged between 35 and 63 years (M = 43; SD = 11.916), which referred high school studies (50%) and university studies (50%), as well as the absence of symptoms related to Covid-19 at the time of the study.
On the other hand, the psychometric validation group was formed intentionally, not probabilistically, and with snowball sampling. A response rate of 96.5% was obtained, due to the fact that 51 people did not provide their consent for the use of data. Likewise, the data from 352 participants was excluded, 277 because they did not meet the age criterion ≥18 years, 33 because they ensured a confirmed diagnosis of Covid-19, 26 because they referred residence abroad, and 16 more due to the detection of repetitions and omissions in the answers. Thus, the final sample consisted of 1,070 Mexican adults, whose main demographic characteristics are observed in Table 1. It should be noted that the sample size was considered sufficient once the number of items was exceeded ten times (54, 55).

Table 1. Sociodemographic characteristics of the sample (n = 1070).

Variable	Category	f	%
Sex	Female	677	63.3
	Male	393	36.7
Age	Young adults	741	69.3
ME = 26.736	Mature adults	314	29.3
DE = 11.181	Older adults	15	1.4
Marital status	Single	723	67.6
	Married	171	16
	Free Union	105	9.8
	Separated	37	3.5
	Divorced	27	2.5
	Widower	7	0.7
Place of residence	Mexico City	270	25.2
	Mexico State	689	64.4
	Another State	111	10.4
Scholarship	Can read and write	2	0.2
	Basic level	81	7.5
	High school	557	52.1
	Bachelor's degree	379	35.4
	Postgraduate studies	51	4.8
Occupation	Remunerated activity	401	37.5
	Housekeeper	88	8.2
	Student	486	45.4
	Retired	12	1.1
	Unemployed before the pandemic	29	2.7
	Unemployed after the pandemic	54	5
Health condition	Excellent	212	19.8
	Very good	313	29.3
	Okay	395	36.9
	Acceptable	130	12.1
	Bad	20	1.9
Chronic diseases	Yes	201	18.8
	No	869	81.2
Covid-19 symptoms	Yes	94	8.8
	No	976	91.2
Family income in mexican pesos	Less than $5000	296	27.7
	$5000 to $10000	393	36.7
	$10000 to $15000	187	17.5
	More than $15000	194	18.1
Chronic diseases in the family	Yes	612	57.2
	No	458	42.8
Covid-19 symptoms in the family	Yes	400	37.4
	No	670	62.6
Covid-19 diagnosis in the family	Yes	372	34.8
	No	698	65.2

Note: Covid-19 = Coronavirus disease.

Instruments

Coronavirus Anxiety Scale (CAS)

CAS measures the frequency of physiological symptoms of anxiety (dizziness, sleep disturbance, tonic immobility, decreased appetite, and nausea or abdominal discomfort) derived from exposure to information and / or thoughts about the new coronavirus in the last two weeks. It presents five items and uses a Likert-type scale from zero to four points (0 = Not at all; 1 = Rare, less than a day or two; 2 = Several days; 3 = More than 7 days and 4 = Nearly every day over the last 2 weeks). The minimum score obtained is zero and the maximum is 20, where scores ≥9 indicate clinically significant physiological anxiety. According to the last study carried out by the original author, the scale has acceptable reliability of α = .92, the sensitivity of 76%, and specificity of 90%, which is why it is considered valid and useful for both research and health-related practice mental health in the context of COVID-19 (30, 31).

For the purpose of this study the translated version, adapted and validated in content by expert and non-expert judges, was used, consisting of the five original items of CAS and its response options (0 = De ningún modo; 1 = Rara vez, menos de un día o dos; 3 = Varios días; 3 = Más de 7 días y 4 = Casi todos los días durante las últimas 2 semanas, Spanish version). On the other hand, for the collection of demographic data, 13 ad hoc questions were included.

Procedure

For validation by judges (expert and non-expert), and in accordance with the control measures of the Covid-19 epidemic outbreak, potential judges were contacted remotely, through phone calls and / or email. They were informed about the purposes of the investigation and the confidentiality of the data obtained. Once they agreed to participate voluntarily, a digitized form was sent. The accuracy of the translation and the adaptation of the items with respect to the original version in English, as well as suggestions for language, writing, style, and assessing the difficulty of the items was requested. The format of the non-expert judges did not include the items in the original language. Next, the percentages of agreement between judges were obtained, for both experts and non-experts, for each of the items. The items with a percentage of agreement between judges ≥80 remained unchanged.

In order to follow the prevention recommendations, for the psychometric validation we opted for the application of an online survey designed in Google Forms®.

Table 2. Distribution, discrimination and factor loadings of Coronavirus Anxiety Scale (CAS) items in a sample of Mexican adults.

Item	Frequency distribution analysis					Normality test					Discrimination Analysis				Factor
	Frequency by response option														
	Response option					M	SD	A	K	Z	Mann-Whitney U	Wilcoxon signed-rank test	Z	ρ	
	0	1	2	3	4										
1. Me sentí mareado, aturdido o débil cuando leí o escuché noticias sobre el coronavirus.	742	208	96	14	10	0.45	0.786	1.934	3.839	0.410***	13014	129417	-22.476***	.733**	0.751
2. Tuve problemas para quedarme dormido porque estaba pensando en el coronavirus.	675	237	101	23	34	0.6	0.969	1.847	3.145	0.364***	6507	122910	-24.428***	.795**	0.752
3. Me sentí paralizado o congelado cuando pensaba o estaba expuesto a información sobre el coronavirus.	688	272	81	19	10	0.5	0.788	1.829	3.651	0.379***	7953	124356	-24.027***	.786**	0.794
4. Perdí interés en comer cuando pensaba o estaba expuesto a información sobre el coronavirus.	879	115	50	17	9	0.28	0.702	2.926	9.072	0.478***	22654	139057	-19.488***	.623**	0.775
5. Sentí náuseas o problemas estomacales cuando pensé o estuve expuesto a información sobre el coronavirus.	862	138	45	15	10	0.29	0.698	2.912	9.322	0.468***	21690	138093	-19.798***	.633**	0.791

Note: M = mean; SD = standart desviation; A = asymmetry; K = kurtosis; F = factor; ρ = item-total correlation.
The items are presented in Spanish.

**p < .01
***p < .001

Between May 18 and 31, 2020, that is, during the last two weeks of the Jornada Nacional de Sana Distancia health program, potential individual participants and in student communities were contacted by Facebook, WhatsApp, and Messenger. Digital invitations that contained the link to the survey were sent, the participants were encouraged to respond and share among their contacts.

Once the data were obtained, the statistical analysis for psychometric validation was carried out. Statistical analysis

Descriptive and inferential analysis with the SPSS program, version 25; AMOS version 23 for confirmatory factor analysis and Microsoft Excel 2013 for calculation of omega (ω) and Livingston's coefficient (K2). It should be noted that because AMOS offers 90% CI for RMSEA (90Lo / 90 HI); the 95% CI for RMSEA was obtained in Run R code online. For statistical tests, significance level $p \leq .05$ was accepted.

To verify the predominant type of distribution (normal or skewed) frequency analysis was carried out. Mean, standard deviation, skewness, kurtosis, and the Kolmogorov-Smirnov Z test was requested. The use of non-parametric statistics was prioritized in the subsequent analyzes. Next, to evaluate the discriminating capacity of the items, a new variable was generated, equivalent to the sum of the items on the scale, and the 25th and 75th percentile values were obtained. This dichotomous variable based on the extreme quartiles was used as a grouping variable to perform the Mann-Whitney U test and compare both groups. Subsequently, an exploratory factor analysis (EFA) was carried out. The type of EFA was principal axis factoring (PAF). The internal reliability of the scale (Cronbach's alpha and coefficient omega) was obtained. Now, to evaluate the fit of the model obtained in the EFA, a confirmatory factor analysis (CFA) was carried out. Afterward, the internal reliability of the new model obtained was obtained (45-50).

To assess the influence of sociodemographic variables on the scale score, the medians were compared through the Mann-Whitney U test (for dichotomous variables) and the Kruskal-Wallis test (for polytomous variables). Subsequently, to obtain candidates for cutoff points the percentiles of the demographic groups that presented statistically significant differences ($p \leq .05$) were calculated (51). Next, to corroborate the appropriateness of the choice of cutoff candidates Livingston's coefficient (K2) was calculated (52). Finally, Receiver Operating Characteristic (ROC) analysis also was carried out (53).

Ethical considerations

The form used the forced response mode, so that the acceptance of the informed consent for the use of data for research purposes, as well as the response of all the items before sending, were required. However, the participant could withdraw from the study at any time. To guarantee confidentiality, in compliance with the international ethical criteria of the Declaration of Helsinki (56) applied to psychological research, and of the Code of Ethics of the Psychologist in force in Mexico (57), no information was requested that could contribute to the identification of the participants.

Results

Translation and adaptation

For items 1, 3, and 4, 80% agreement was obtained between expert judges, while for items 2 and 5, 90% was obtained. Among the non-expert judges, the percentage of agreement for item 2 was 100% and 83.3% for the rest of the items. Therefore, the proposed translation and adaptation of the scale remained unchanged.

Distribution analysis, discrimination and Exploratory Factor Analysis (EFA)

From the analysis of the frequencies of each of the items, it was found that all the response options presented frequency, that is, each one of the options was chosen by the participants at least once. The calculation of the mean, standard deviation, skewness, kurtosis, and the Kolmogorov-Smirnov Z test corroborated a skewed distribution, for which the use of non-parametric statistics was prioritized in the following analyzes. Comparison of the extreme groups (first and fourth quartiles) and the total score through the Mann-Whitney U test showed significant differences ($p =. 000$). Likewise, the

Table 3. Criteria of goodness of fit of the factor structure of Coronavirus Anxiety Scale (CAS) in a sample of Mexican adults.

	χ^2	χ^2/df	SRMR	RMSEA	GFI	AGFI	TLI	CFI
Five Items Model for Mexicans Adults	89.836**	17.967	0.0378	0.126	0.956	0.868	0.909	0.954
Four Items Model for Mexicans Adults	8.047*	4.023	0.0141	0.053	0.996	0.981	0.985	0.995
Original Model (30)	2.68	0.54	0.01	0	NR	NR	1	1
Psychometric Examination of Original Model (31)	25.2**	5.04	0.02	0.1	NR	NR	0.99	0.99

Note: χ^2 = chi-square test; χ^2/df = chi-square / degrees of freedom; SRMR = Standarized Root Mean-Square; RMSEA = Root Mean Square Error of Approximation; GFI = Goodness of Fit Index; AGFI = Adjusted Goodness of Fit Index; TLI = Tucker-Lewis Index; CFI = Comparative Fit Index; NR = Not reported.
*p < .05
**p < .01

correlation between the total of the test and each of the items showed correlations ρ> .30 and was significant (p = .01), so they discriminated significantly.

Through the principal axis factoring (PAF), a solution that explains 62.238% of the variance was found. In addition, the Kaiser-Meyer-Olkin (KMO) test was obtained, which was acceptable (KMO = .829) and Bartlett's test was significant (χ^2(10) = 1861.001, p = .000), so the correlation matrix was considered adequate. The analysis of the distribution, discrimination, and the EFA are summarized in Table 2.

Reliability (five-item version)
The total reliability of the scale was obtained using Cronbach's alpha coefficient (α = .825) and the omega coefficient (ω = .881), both were acceptable.

Confirmatory Factor Analysis (CFA)
A CFA was run and it was identified that the original single-factor model of five items (χ^2(5) = 89.836, p = .000) did not yield a proper fit for all of the indices [χ^2/df ratio = 17.967; CFI = 0.954; TLI = 0.909; SRMR = .0378; RMSEA = .126 (.099, .153; 95% CI)]. Then, the fourth item was justifiably eliminated. The CFA was run again and yielded a new model (χ^2(2) = 8.047, p = .018) with an excellent fit for all of the indices [χ^2/df ratio = 4.023; CFI = 0.995; TLI = 0.985; SRMR = .0141; RMSEA = .053 (.009, .100; 95% CI)]. The new model, with four items, for coronavirus physiological anxiety is observed in Figure 1 and is compared in Table 3 with the model of the original author (30), the review (31), as well as the original model of five items for adult Mexican population.

Reliability (four-item version)
Reliability, using Cronbach's alpha (α = .792), as well as through the omega coefficient (ω = .868), were acceptable for the new scale, with a single-factor model. The new assessment tool was called Coronavirus Anxiety Scale 4, Spanish version (CAS-4SP).

Mean differences analyses
The Mann-Whitney U test and Kruskal-Wallis test were applied in order to identify differences in the scores obtained on the CAS-4SP according to sociodemographic variables. Women had higher scores (M = 2.01; SD = 2.521) than men (M = 1.55; SD = 2.607) and the differences were statistically significant (p = .000). Likewise, the participants
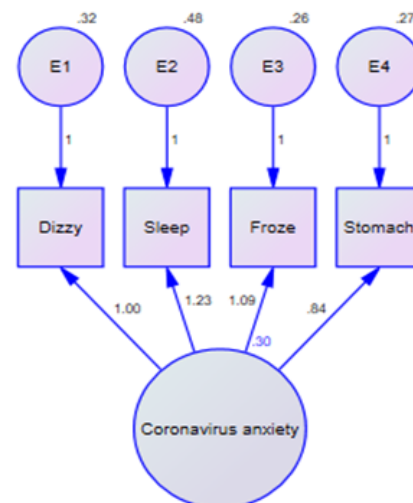

Figure 1. Factorial structure of the Coronavirus Anxiety Scale (CAS-4SP) in a sample of Mexicans adults. Dizzy = dizziness; Sleep = sleep disturbance; Froze = tonic immobility; Stomach = nausea or abdominal distress.

Table 4. Candidates for cutoff points of Coronavirus Anxiety Scale, Spanish and four items version (CAS-4SP), according to percentiles and Livingston's coefficient (K^2) by sex and presence of Covid-19 symptoms.

Percentile	Sex						Covid Symtoms					
	M			F			M			F		
	Cutoff point	K^2 with ω	K^2 with α	Cutoff point	K^2 with ω	K^2 with α	Cutoff point	K^2 with ω	K^2 with α	Cutoff point	K^2 with ω	K^2 with α
1	0	0.913	0.863	0	0.913	0.862	0	0.913	0.863	0	0.913	0.863
10	0	0.913	0.863	0	0.913	0.862	0	0.913	0.863	0	0.913	0.863
20	0	0.913	0.863	0	0.913	0.862	0	0.913	0.863	0	0.913	0.863
30	0	0.913	0.863	0	0.913	0.862	0	0.907	0.853	1	0.881	0.812
40	0	0.913	0.863	1	0.881	0.812	1	0.881	0.812	2	0.869	0.793
50	0	0.913	0.863	1	0.881	0.812	2	0.869	0.793	3	0.891	0.827
60	1	0.881	0.812	2	0.868	0.792	2	0.869	0.793	3	0.891	0.827
70	1	0.881	0.812	3	0.89	0.827	5	0.944	0.911	4	0.923	0.878
80	3	0.891	0.827	4	0.923	0.878	6	0.966	0.947	6	0.958	0.934
90	5	0.948	0.917	6	0.963	0.942	10	0.987	0.98	8	0.979	0.968
99	11	0.991	0.985	11	0.99	0.984	11	0.99	0.985	9	0.985	0.976

Note: Covid-19 = Coronavirus Disease; M= Male; F = Female; K^2 with ω = Livingston's coefficient with reliability coefficient omega; K^2 with α = Livingston's coefficient with reliability coefficient alpha (α).

who reported symptoms related to Covid-19 had higher scores (M = 3.12; SD = 3.114) than those who did not refer them (M = 1.72; SD = 2.469) and the differences were statistically significant (p = .000).

In addition, the participants who claimed to have acquaintances, friends or relatives with symptoms related to Covid-19 (M = 2.14; SD = 2.734; p = .001), to have relatives with a confirmed diagnosis of Covid-19 (M = 2.17; SD = 2.786; p = .003) or diagnosis of any chronic disease (M = 1.96; SD = 2.532; p = .003) had higher scores. Opposingly, who reported not having acquaintances, friends or relatives with Covid-19 symptoms (M = 1.66; SD = 2.438; p = .001), not having relatives with a confirmed diagnosis of Covid-19 (M = 1.67; SD = 2.418; p = .003) or with a diagnosis of any chronic disease (M = 1.68; SD = 2.594; p = .003) had lower scores.

The differences were statistically significant (p < .05).

On the other hand, age, marital status, place of residence, education, occupation, monthly family income, and social security did not show statistically significant differences (p> .05) in the score of physiological anxiety due to coronavirus.

Receiver Operating Characteristics (ROC) Analysis

The percentiles of the demographic groups that presented statistically significant differences were obtained. The percentiles for the variables sex and Covid-19 symptoms were maintained, the other variables that showed significant differences were not considered because they showed cutoff points very similar to those obtained for participants with Covid-19 symptoms. Table 4 shows the candidates for cutoff points, by sex and Covid-19 symptoms, obtained through the calculation of percentiles. In addition, Livingston's coefficient (K2) was obtained for each one of the candidates for cutoff points and the result was K2> .78 for reliability by Cronbach's alpha and K2> .85 with omega coefficient. Furthermore, they were higher at the extremes of the distribution, so they were accepted as preliminary cutoff points and the 71st percentile was selected to classify the participants.

Subsequently, a ROC analysis was run. Figure 2 shows the ROC curve. The convex shape indicates good discrimination ability and the area under the curve (AUC) has solid diagnostic precision for CAS-4SP (AUC = .985, p = .000). The cutoff points (≥3 for men, ≥4 for women, as well as ≥6 for men

Table 5. Cut scores for the Mexican population of the Coronavirus Axiety Scale, Spanish and four items version (CAS-4SP).

Percentile	Sex		Covid-19 symtoms			
			Yes		No	
	M	F	M	F	M	F
1						
10						
20						
30		0	0	1		
40			1	2		0
50	0	1			0	1
60		2	2	3		
70	1	3	3 a 5	4	1	2
80	2 a 3	4	6 a 9	5 a 6	2	3 a 4
90	4 a 5	5 a 6	10	7 a 8	3 a 5	5
99	≥6	≥7	≥11	≥9	≥6	≥6

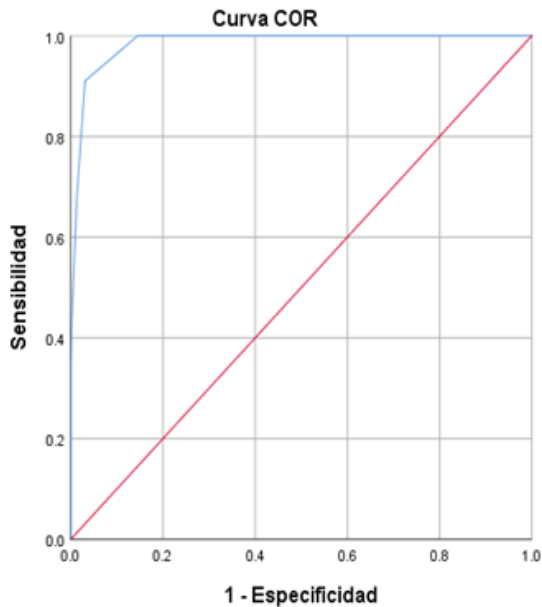| Percentile rank	Clasification
≥71	High
61-70	High average
31-60	Average
21-30	Low average
≤20	Low

Note: M= Male; F = Female.

Figure 2. Area under the ROC curve.

with Covid-19 symptoms, and ≥5 for women with Covid-19 symptoms) classify dysfunctional levels of physiological anxiety in Mexican adults with 91% sensitivity, 96.9% specificity (Youden's Index of. 88) and a false positive rate of 3.6%.

Standardization

Based on the analysis of the psychometric properties of the CAS-4SP for the Mexican population, and to identify the intensity of coronavirus physiological anxiety, Table 5 shows the corresponding cut scores, as well as the classification of the levels of anxiety.

Discussion

The objective of the present study was to adapt to the Coronavirus Anxiety Scale (CAS) and identify its psychometric properties for the Mexican adult population. The Spanish version comprised of four items (CAS-4SP), showed acceptable reliability (α = .792; ω = .868), very close to that obtained for the Turkish population (34), but lower than that reported for the US population (30, 31) and Polish (33). If the Cronbach's alpha coefficient (α) is considered, the internal consistency of the new scale is low because it seeks to detect and classify anxiety associated with the new coronavirus (SARS-CoV-2), a complex health problem in which decision-making derived from the evaluation is crucial to guarantee access to timely care and treatment

(58). However, the calculation of the omega coefficient (ω) allows a more precise measure of reliability (50). Thus, obtaining a value close to .9 in the case of the CAS-4SP enables the acceptance of the scale as a reliable measure.

In addition to the above, the sensitivity (91%) and specificity (96.9%) obtained for the CAS-4SP coincide and are comparable with those shown in the original study and its examination (30, 31), as well as those reported for the instruments that measure the anxiety construct, for example, Generalized Anxiety Disorder 7 (GAD-7). Furthermore, as the original author points out, it outperforms other diagnostic tests such as the State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA), the General Health Questionnaire (GHQ), and the Distress Thermometer (30, 31). It should be noted that obtaining high percentages of sensitivity and specificity is considered to be related to the use of a methodology that combines the identification of the candidates for cutoff points using percentiles, Livingston's coefficient (K2), and ROC analysis (50, 53). In this way, the psychometric properties of the new scale are considered confirmed and adequate for the Mexican population.

Regarding the single-factor structure of the CAS-4SP, it coincides with that reported in the different validation and adaptation studies of the original test (30, 31, 33, 34). This is not surprising because the items focus on the measurement of somatic symptoms of anxiety that have been widely described in the literature (3-10, 30, 31). However, the five-item model did not show a proper fit, so it underwent modifications when item four was eliminated, corresponding to the decrease in appetite when exposed to information related to the coronavirus. It is considered that the item, although it showed the appropriate distribution, discrimination, and factor loading properties, was not sufficiently relevant due to the reasons explained below.

Although the literature indicates the loss of appetite as a physiological symptom of dysfunctional anxiety, especially in the form of panic disorder, the presence of changes in appetite (8, 30, 31), it is a common symptom and

more strongly associated with major depressive disorder. Even though anxiety and depression often appear as commodities (1, 9), they are distinct entities. In this way, changes in appetite and the consequent ingestion of food during emotional states of anxiety take place in both directions, meaning they can decrease and / or increase.

Prior findings (59), the experience in previous epidemic outbreaks, and in the current crisis (60) indicate that anxiety traits can lead to excessive calorie consumption due to natural and expected response to the psychological and physiological mechanisms of the anxious emotional state, mainly in women. Additionally, measures such as social distancing and self-isolation to control the Covid-19 outbreak facilitate free and continuous access to food, higher caloric intake, and sedentary behaviors of low energy expenditure. This explains that, for the sample studied, made up mostly of Mexican women, the frequencies for the response options with the lowest scores in item four were very high.

It should be noted that the two models analyzed, the one with five items and the other with four, show an adjustment very similar to those reported by the original researchers and those of cultural adaptations (30, 31, 33, 34), so it is suggested to conduct future research comparing both models in Mexican adults. For now, the new model can only be generalizable to the population studied. This is why it is considered necessary to replicate the methodology, as well as to carry out an exhaustive review of the four items that make up the new scale in order to enrich them. For this it is proposed to analyze the specialized literature and the proposals for measuring coronavirus anxiety somatic symptoms that are contemplated in other inventories and questionnaires (35-41, 43, 44).

With respect to the differences between the scores on the CAS-4SP and the sex variable, the results differ from those found in previous investigations for the CAS, which do not report differences between the scores of men and women. However, it is widely documented that women have higher levels of anxiety in regular conditions (1, 3, 5, 9) and in the face of the Covid-

19 pandemic (16, 20, 22-24, 26). As regards the symptoms associated with Covid-19, both the original version (30, 31), the Polish adaptation (33), and recent studies on coronavirus anxiety (17-19), agree that the participants who have coronavirus symptoms report higher levels of anxiety than those who do not have symptoms or have other diagnoses.

However, it is important to underline the main limitations of this research. The use of a cross-sectional design in a dynamic and uncertain context, such as the Covid-19 pandemic stands out. Given its prolongation in time, it is necessary to carry out more studies regarding the validity of the CAS-4SP throughout the different stages of the health crisis and even consider the period after the pandemic and its probable transition to endemic. Another limitation refers to the type of non-probability and snowball sampling in which women, young adults with university studies, and concentrated in metropolitan areas are overrepresented, so, the results are likely to be a description of the characteristics of the sample, difficult to generalize to the Mexican population. Evenly, the fact that an online survey has been chosen increases the chances of obtaining the wrong answers, either due to social desirability or because of not properly following the instructions. Likewise, while it is true that remote research contributes to the decrease in the spread of Covid-19, it has profound implications in the inequality of access to information, knowledge, and technology. Hence, it is urgent to propose collection data methods that ensure equity and representation of the diversity of the Mexican population and ante up to closing the social, cultural, and technological gaps it presents.

Finally, it is suggested to carry out research aimed at solving three aspects that were not considered in the present study. The aspects are: 1) the analysis of the criterion-related validity through the application of measurement instruments with adequate psychometric properties for the Mexican population. 2) The inclusion of participants who report a diagnosis of Covid-19, either before or at the time of

application of the scale. 3) The use of statistical methods for samples with skewed distribution.

Despite the limitations stated, the CAS-4SP is considered to be a short, reliable, valid, sensitive, and specific tool that contributes to the detection of dysfunctional physiological anxiety in the context of the Covid-19 pandemic and its differentiation from others clinical pictures, so it can be used both in research and in medical contexts. In the latter, given their rapid application and interpretation, first-contact health personnel, and even those on the front line in the fight against the pandemic, will be able to provide quality assistance through early referral and facilitation of access to specialized health services.

Additionally, it is considered that the determination of cut scores according to sex and the Covid-19 symptoms favor access to mental health care with equity, a gender perspective, and without stigmatization. Even the massive application of the CAS-4SP can be considered among the objectives of epidemiological research in mental health, during and after the health crisis. These results can be translated into public policies that, in turn, make visible, prevent, and mitigate the effects of the dysfunctional psychological symptoms and mental disorders that afflict the Mexican population long before the arrival of Covid-19 and that have been exacerbated along with its course.

References

1. World Health Organization. Depression and other common mental disorders. Global health estimates [Internet]. Geneva, (CH): WHO Document Production Services; c2017 [cited 2020 Aug 16]. 22 p. Available from: https://apps.who.int/iris/bitstream/handle/10665/254610/WHO-MSD-MER-2017.2-eng.pdf

2. Secretaría de Salud. Guía Clínica Práctica. Diagnóstico y tratamiento de los Trastornos de Ansiedad en el Adulto [Internet]. México (MX): Centro Nacional de Excelencia Tecnológica en Salud; c2010 [cited 2020 Aug 16]. 61 p. Available from: http://www.cenetec.salud.gob.mx/descargas/gpc/CatalogoMaestro/392_IMSS_10_Ansiedad/EyR_IMSS_392_10.pdf. Spanish.

3. Parekh R. What are anxiety disorders? [Internet]. Washington: American Psychiatric Association; c2017 [cited 2020 Aug 16]. Available from: https://www.psychiatry.org/patients-families/anxiety-disorders/what-are-anxiety-disorders

4. APA Dictionary of Psychology. Anxiety [Internet]. Washington: American Psychological Association; c2020 [cited 2020 Aug 16]. Available from: https://dictionary.apa.org/anxiety

5. Anxiety [Internet]. Washington: American Psychological Association; c2020 [cited 2020 Aug 16]. Available from: https://www.apa.org/topics/anxiety

6. Beyond worry: How psychologists help with anxiety disorders [Internet]. Washington: American Psychological Association; c2016 [cited 2020 Aug 16]. Available from: https://www.apa.org/topics/anxiety-disorders

7. Rector NA, Bourdeau D, Kitchen K, Joseph-Massiah L. Anxiety disorders: an information guide: a guide for people with anxiety and their families [Internet]. Toronto (CA): Centre for Addiction and Mental Health; c2008 [cited 2020 Aug 16]. 58 p. Available from: https://www.camh.ca/-/media/files/guides-and-publications/anxiety-guide-en.pdf

8. Diagnostic and Statistical Manual of Mental Disorders. Fifth Edition. DSM-5 [Internet]. Arlington (VA): American Psychiatric Association; c2013 [cited 2020 Aug 16] 970 p. Available from: https://cdn.website-editor.net/30f11123991548a0af708722d458e476/files/uploaded/DSM%2520V.pdf

9. Anxiety and Depression [Internet]. Silver Spring (MD): Anxiety and Depression Association of America; [cited 2020 Aug 16] 20 p. Available from: https://adaa.org/sites/default/files/ADAA_ Anx&Dep.pdf

10. Adwas AA, Jbireal JM, Azab AE. Anxiety: insights into signs, symptoms, etiology, pathophysiology, and treatment. East African Scholars J Med Sci [Internet]. 2019 Oct [cited 2020 Aug 16];2(10):580-91. Available from: https://www.researchgate.net/publication/ 336738068_Anxiety_Insights_into_Signs_S ymptoms_Etiology_Pathophysiology_and_T reatment

11. Coronavirus [Internet]. Geneve (CH): World Health Organization; c2020 [cited 2020 Aug 16]. Available from: https://www.who.int/health-topics/coronavirus#tab=tab_1

12. Inter-Agency Standing Committee. Operational considerations for multisectoral mental health and psychosocial support programmes during the COVID-19 pandemic [Internet]. Geneva, (CH): IASC; c2020 [cited 2020 Aug 16]. 49 p. Available from: https://interagencystandingcommittee.org /system/files/2020-06/IASC%20Guidance%20on%20Operation al%20considerations%20for%20Multisector al%20MHPSS%20Programmes%20during% 20the%20COVID-19%20Pandemic.pdf

13. Ramos C. Covid-19: la nueva enfermedad causada por un coronavirus. Salud Púb Méx [Internet]. 2020 Mar-Apr [cited 2020 Aug 16];62(2):225-227. Available from: https://doi.org/10.21149/11276. Spanish.

14. Zheng W. Mental health and a novel coronavirus (2019-nCoV) in China. J Affect Disord [Internet]. 2020 May [cited 2020 Aug 16];269:201-2. Available from: https://doi.org/10.1016/j.jad.2020.03.041

15. Pan American Health Organization. Protección de la salud mental en situaciones de epidemias [Internet]. Washington, (DC): PAHO; c2026 [cited 2020 Aug 16]. 49 p. Available from: https://www.paho.org/hq/dmdocuments/2 009/Pandemia%20de%20influenza%20y%2 0Salud%20mental%20Esp.pdf. Spanish.

16. Huang Y, Zhao N. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: a web-based cross-sectional survey. Psychiatry Research [Internet]. 2020 Apr [cited 2020 Aug 16];288:112954. Available from: https://doi.org/10.1016/j.psychres.2020.11 2954

17. Xiang YT, Yang Y, Li W, Zhang L, Zhang Q, Cheung T, Chee HN. Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. Lancet Psychiat [Internet]. 2020 Mar [cited 2020 Aug 16];7:228-9. Available from: https://doi.org/10.1016/S2215-0366(20)30046-8

18. Duan L. Zhu G. Psychological interventions for people affected by the COVID-19 epidemic. Lancet Psychiat [Internet]. 2020 Apr [cited 2020 Aug 16];7(4):300-2. Available from: https://doi.org/10.1016/S2215-0366(20)30073-0.

19. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, Ho RC. Immediate psychological responses and associated factors during the initial stage of the 2019 Coronavirus Disease (COVID-19) epidemic among the general population in China. Int J Environ Res Public Health [Internet]. 2020 Mar [cited 2020 Aug 16];17(5):1729. Available from: https://doi.org/10.3390/ijerph17051729

20. Gamonal RS, Montero E, Fernández JM, Roncero C. Anxiety, worry and perceived stress in the world due to the COVID-19 pandemic, March 2020. Preliminary results.

MedRxiv 20043992 [Preprint]. 2020 [cited 2020 Aug 16]: [11 p.]. Available from: https://doi.org/10.1101/2020.04.03.20043 992

21. Zandifar A. Iranian mental health during the COVID-19 epidemic. Asian J Psychiatr [Internet]. 2020 Feb [cited 2020 Aug 16];51:101990. Available from: https://doi.org/10.1016/j.ajp.2020.101990

22. Toledo-Fernández A, Betancourt-Ocampo D, Romo-Parra H, Reyes-Zamorano E, González-González A. A cross-sectional survey of psychological distress in a Mexican sample during the second phase of the COVID-19 pandemic. OFS [Preprint]. 2020 [cited 2020 Aug 16] [23 p.]. Available from: https://osf.io/wzqkh

23. Priego-Parra BA, Triana-Romero A, Pinto-Gálvez SM, Durán C, Salas-Nolasco O, Manriquez M, Ramos-de-la-Medina A, Remes-Troche JM. Anxiety, depression, attitudes, and internet addiction during the initial phase of the 2019 coronavirus disease (COVID-19) epidemic: A cross-sectional study in México. MedRxiv 20095844 [Preprint]. 2020 [cited 2020 Aug 16] [27 p.]. Available from: https://doi.org/10.1101/2020.05.10.20095 844

24. Moghanibashi-Mansourieh A. Assessing the anxiety level of Iranian general population during COVID-19 outbreak. Asian J Psychiatr [Internet]. 2020 Apr [cited 2020 Aug 16];51:102076. Available from: https://doi.org/10.1016/j.ajp.2020.102076

25. Roy D, Tripathy S, Kar SK, Sharma N, Vermaa SK, Kaushal V. Study of knowledge, attitude, anxiety & perceived mental healthcare need in Indian population during COVID-19 pandemic. Asian J Psychiatr [Internet]. 2020 Apr [cited 2020 Aug 16];51:102083. Available from: https://doi.org/10.1016/j.ajp.2020.102083

26. Shevlin M, McBride O, Murphy J, Miller JG, Hartman TK, Levita L, Mason L, Martinez A, McKay R, Stocks TVA, Bennett KM, Hyland P, Karatzias T, Bentall RP. Anxiety, Depression, Traumatic Stress, and COVID-19 Related Anxiety in the UK General Population During the COVID-19 Pandemic. PsyArRXiv HB6NQ [Preprint]. 2020 [cited 2020 Aug 16] [27 p.]. Available from: https://doi.org/10.31234/osf.io/hb6nq

27. Shanafelt T, Ripp J, Trockel M. Understanding and addressing sources of anxiety among health care professionals during the Covid-19 pandemic. JAMA [Internet]. 2020 Apr [cited 2020 Aug 16] 6];323(21):2133-3. Available from: https:// doi.org/10.1001/jama.2020.5893

28. Ozamiz-Etxebarria N, Dosil-Santamaria M, Picaza-Gorrochategui M, Idoiaga-Mondragon N. Niveles de estrés, ansiedad y depresión en la primera fase del brote del COVID-19 en una muestra recogida en el norte de España. Cad Saúde Pública [Internet]. 2020 Apr [cited 2020 Aug 16];36(4):e00054020. Available from: https://doi.org/10.1590/0102-311X00054020. Spanish.

29. Vicario-Merino A, Muñoz-Agustin N. Analysis of the stress, anxiety and healthy habits in the Spanish Covid-19 confinement. Health Sci J [Internet]. 2020 Apr [cited 2020 Aug 16];14(2):707. Available from: https://doi.org/10.36648/1791-809X.14.2.707

30. Lee SA. Coronavirus Anxiety Scale: A brief mental health screener for COVID-19 related anxiety. Death Stud [Internet]. 2020 Apr [cited 2020 Aug 16];44(7):393-401. Available from: https://doi.org/10.1080/07481187.2020.17 48481

31. Lee SA, Mathis AA, Jobe MC, Pappalardo EA. Clinically significant fear and anxiety of COVID-19: A psychometric examination of

the Coronavirus Anxiety Scale. Psychiatry Res [Internet]. 2020 May [cited 2020 Aug 16];290:113112. Available from: https://doi.org/10.1016/j.psychres.2020.113112

32. Lee SA, Jobe MC, Mathis AA. Mental health characteristics associated with dysfunctional coronavirus anxiety. Psychol Med [Internet]. 2020 Apr [cited 2020 Aug 16];1-2. Available from: https://doi.org/10.1017/S003329172000121X

33. Skalski S, Uram P, Dobrakowski P, Kwiatkowska A. The link between ego resiliency, social support, SARS COV 2 anxiety and trauma effects. Polish adaptation of the coronavirus anxiety scale. PsyArRXiv 28TNW [Preprint]. 2020 [cited 2020 Aug 16] [16 p.]. Available from: https://doi.org/10.31234/osf.io/28tnw

34. Evren C, Evren B, Dalbudak E, Topcu M, Kutlu N. Measuring anxiety related to COVID-19: A Turkish validation study of the Coronavirus Anxiety Scale. Death Stud [Internet]. 2020 June [cited 2020 Aug 16];1-7. Available from: https://doi.org/10.1080/07481187.2020.1774969

35. Ahorsu DK, Lin CY, Imani V, Saffari M, Griffiths MD, Pakpour AH. The Fear of COVID-19 Scale: development and initial validation. Int J Ment Health Ad [Internet]. 2020 Mar [cited 2020 Aug 16];1-9. Available from: https://doi.org/10.1007/s11469-020-00270-8

36. Bitan DT, Grossman-Giron A, Bloch Y, Mayer Y, Shiffman N, Mendlovic S. Fear of COVID-19 Scale: Psychometric characteristics, reliability and validity in the Israeli population. Psychiatry Res [Internet]. 2020 May [cited 2020 Aug 16];289:113100. Available from: https://doi.org/10.1016/j.psychres.2020.113100

37. Haktanir A, Seki T, Dilmaç B. Adaptation and evaluation of Turkish version of the fear of COVID-19 Scale. Death Stud [Internet]. 2020 May [cited 2020 Aug 16]:1-9. Available from: https://doi.org/10.1080/07481187.2020.1773026

38. Reznik A, Gritsenko V, Konstantinov V, Khamenka N, Isralowitz R. COVID-19 Fear in Eastern Europe: Validation of the Fear of COVID-19 Scale. Int J Ment Health Ad [Internet]. 2020 May [cited 2020 Aug 16]:1-6. Available from: https://doi.org/10.1007/s11469-020-00283-3

39. Chandu VC, Pachava S, Vadapalli V, Marella Y. Development and initial validation of the COVID-19 Anxiety Scale. J Public Health [Internet]. 2020 June [cited 2020 Aug 16];64:S201-4. Available from: https://pesquisa.bvsalud.org/portal/resource/es/mdl-32496255

40. Nikčević AV, Spada MM. The COVID-19 anxiety syndrome scale: Development and psychometric properties. Psychiatry Res [Internet]. 2020 July [cited 2020 Aug 16];292:113322. Available from: https://doi.org/10.1016/j.psychres.2020.113322

41. Alipour A, Ghadami A, Alipour Z, Abdollahzadeh H. Preliminary Validation of the Corona Disease Anxiety Scale (CDAS) in the Iranian Sample. Quarterly Journal of Health Psychology [Internet]. 2020 Mar [cited 2020 Aug 16];8(4):163-75. Available from: https://doi.org/10.30473/HPJ.2020.52023.4756. Persian.

42. Asmundson JGG. Taylor S. Coronaphobia: Fear and the 2019-nCoV outbreak. J Anxiety Disord [Internet]. 2020 Feb [cited 2020 Aug 16];70:102196. Available from: https://doi.org/10.1016/j.janxdis.2020.102196

43. Arpaci I, Karataş K, Baloğlu M. The development and initial tests for the psychometric properties of the COVID-19 Phobia Scale (C19P-S). Pers Individ Dif [Internet]. 2020 May [cited 2020 Aug 16];164:110108. Available from: https://doi.org/10.1016/j.paid.2020.110108

44. Rodríguez-de Avila UE, Leon-Valle ZL, Ceballos-Ospino GU. Comportamiento psicométrico de la Zung Self-Rating Anxiety Scale-15 (SAS-15) versión español, durante el Aislamiento Físico por Pandemia por Covid-19. Duazary [Internet]. 2020 July [cited 2020 Aug 16];17(3):7-9. Available from: https://doi.org/10.21676/2389783X.3469. Spanish.

45. Reyes LI, García BLF. (2008). Procedimiento de validación psicométrica culturalmente relevante. Un ejemplo. In Rivera, Sofía; Díaz, Ronaldo; Sánchez, Rozzana; Reyes Isabel L. editors. La Psicología Social en México XII [Internet]. México (MX): Asociación Mexicana de Psicología Social; c.2008 [cited 2020 Aug 16]. [8 p.]. Available from: https://www.researchgate.net/publication/259191173_PROCEDIMIENTO_DE_VALIDACION_PSICOMETRICA_CULTURALMENTE_RELEVANTE_UN_EJEMPLO. Spanish.

46. Montero I, León OG. A guide for naming research studies in Psychology. Int J Clin Health Psychol [Internet]. 2007 July [cited 2020 Aug 16];7(3):847-62. Available from: https://www.redalyc.org/pdf/337/33770318.pdf. Spanish.

47. Morata-Ramírez MA, Holgado-Tello FP, Barbero-García I, Méndez G. Análisis factorial confirmatorio. Recomendaciones sobre mínimos cuadrados no ponderados en función del error tipo I de ji-cuadrado y RMSEA. Acción Psicol [Internet]. 2015 June [cited 2020 Aug 16];12(1):79-90. Available from: http://dx.doi.org/10.5944/ap.12.1.14362. Spanish.

48. Cupani M. Análisis de Ecuaciones Estructurales: conceptos, etapas de desarrollo y un ejemplo de aplicación. Tesis [Internet]. 2012 Oct [cited 2020 Aug 16];2(1);186-99. Available from: https://revistas.unc.edu.ar/index.php/tesis/article/view/2884. Spanish.

49. Salazar C, Serpa A. Análisis confirmatorio y coeficiente Omega como propiedades psicométricas del instrumento Clima Laboral de Sonia Palma. Rev Investig Psicol [Internet]. 2017 Dec [cited 2020 Aug 16];20(2):377-88. Available from: https://revistasinvestigacion.unmsm.edu.pe/index.php/psico/article/view/14047. Spanish.

50. Ventura-León JL, Caycho-Rodríguez T. El coeficiente Omega: un método alternativo para la estimación de la confiabilidad. Rev Latinoam Cienc Soc Niñez Juv [Internet]. 2017 June [cited 2020 Aug 16];15(1):625-7. Available from: https://www.redalyc.org/pdf/773/77349627039.pdf. Spanish.

51. Fuentes LE. Metodología para la elección de punto de corte óptimo para dicotomizar covariables continuas. Rev Cubana Genet Comunit [Internet]. 2014 Sep [cited 2020 Aug 16];7(3):36-42. Available from: https://www.medigraphic.com/pdfs/revcubgencom/cgc-2013/cgc133f.pdf. Spanish.

52. Fernández M, Merino C. Error de medición alrededor de los puntos de corte en el MBI-GS. Liberabit [Internet]. 2014 Sep [cited 2020 Aug 16];20(2):209-18. Available from: https://biblat.unam.mx/hevila/Liberabit/2014/vol20/no2/2.pdf. Spanish.

53. Cerda J, Cifuentes L. Uso de curvas ROC en investigación clínica. Aspectos teórico-prácticos. Rev Chil Infect [Internet]. 2012 July [cited 2020 Aug 16];29(2):138-41. Available from: http://dx.doi.org/10.4067/S0716-10182012000200003. Spanish.

54. Nunnally J, Bernstein I. Psychometric theory. 3rd ed. New York: McGraw-Hill; 1994. 752 p.

55. Velasco-Rojano E, Duarte-Ayala A, RE, Riveros-Rosas A, Sánchez-Sosa JJ, Reyes-Lagunes LI. Validación de la Escala de Gravedad de Fatiga en población general de la Ciudad de México. Evaluar [Internet]. 2017 Sep [cited 2020 Aug 16];17(2):113-25. Available from: https://www.redalyc.org/pdf/337/3377031 8.pdf. Spanish.

56. WMA Declaration of Helsinki – ethical principles for medical research involving human subjects. [Internet]. Ferney-Voltaire: The World Medical Association, Inc.; c2018 [cited 2020 Aug 16]. Available from: https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/

57. Sociedad Mexicana de Psicología. Código ético del Psicólogo [Internet]. México, (MX): Trillas; c2009 [cited 2020 Aug 16]. 119 p. Available from: http://www.psicologia.unam.mx/document os/pdf/comite_etica/CODIGO_ETICO_SMP. pdf. Spanish.

58. Reidl-Martínez LM. Confiabilidad en la medición. Inv Ed Med [Internet]. 2013 Jan [cited 2020 Aug 16];2(6):107-11. Available from: https://doi.org/10.1016/S2007-5057(13)72695-4. Spanish.

59. Mestre ZL, Melhorn SJ, Askren MK, Tyagi V, Gatenby JC, Young LL, Mehta S, Webb M, Grabowski TJ, Schur EA. Effects of anxiety on caloric intake and satiety-related brain activation in women and men. Psychosom Med [Internet]. 2016 May [cited 2020 Aug 16];78(4):454–64. Available from: https://doi.org/10.1097/PSY.00000000000 00299

60. Naja F, Hamadeh R. Nutrition amid the COVID-19 pandemic: a multi-level framework for action. Eur J Clin Nutr [Internet]. 2020 Apr [cited 2020 Aug 16];74:1117–21. Available from: https://doi.org/10.1038/s41430-020-0634-3