Electronic Journal of General Medicine
2022, 19(6), em407
e-ISSN: 2516-3507
https://www.ejgm.co.uk/

MODESTUM

Original Article

OPEN ACCESS

Psychometric evidence of a new short version in Spanish of the COVID-19 impact scale: A study based on confirmatory factor analysis, graded response model, multigroup analysis, and path analysis

Tomás Caycho-Rodríguez [1]*, Lindsey W. Vilca [2], Carlos Carbajal-León [3], Mario Reyes-Bossio [4], Mariel Delgado-Campusano [4], Miguel Gallegos [5,6,7], Renzo Carranza Esteban [8], Martin Noe-Grijalva [9]

[1] Facultad de Ciencias de la Salud, Universidad Privada del Norte, Lima, PERU
[2] South American Center for Education and Research in Public Health, Universidad Norbert Wiener, Lima, PERU
[3] Universidad Norbert Wiener, Lima, PERU
[4] Facultad de Psicología, Universidad Peruana de Ciencias Aplicadas, Lima, PERU
[5] Departamento de Psicología, Facultad de Ciencias de la Salud, Universidad Católica del Maule, Talca, CHILE
[6] Pontificia Universidade Católica de Minas Gerais, Minas Gerais, BRAZIL
[7] Consejo Nacional de Investigaciones Científicas y Técnicas, Buenos Aires, ARGENTINA
[8] Investigación Avances en Investigación Psicológica, Universidad San Ignacio de Loyola, Lima, PERU
[9] Escuela de Psicología, Universidad César Vallejo, Trujillo, PERU
***Corresponding Author:** tomas.caycho@upn.pe

Citation: Caycho-Rodríguez T, Vilca LW, Carbajal-León C, Reyes-Bossio M, Delgado-Campusano M, Gallegos M, Carranza Esteban R, Noe-Grijalva M. Psychometric evidence of a new short version in Spanish of the COVID-19 impact scale: A study based on confirmatory factor analysis, graded response model, multigroup analysis, and path analysis. Electron J Gen Med. 2022;19(6):em407. https://doi.org/10.29333/ejgm/12388

ARTICLE INFO

Received: 16 Jun. 2022

Accepted: 11 Aug. 2022

ABSTRACT

The aim of the study was to translate and evaluate the psychometric evidence of the Spanish version of the COVID-19 impact scale in the general population of Peru, to measure psychological stress responses produced by the COVID-19 pandemic, including emotional responses and difficulty in performing activities of daily living. Participants were 601 Peruvians, who responded to an online survey consisting of questions designed to collect sociodemographic data, the CIS and the fear of COVID-19 scale. The forward and backward translation method was used to translate the English version into Spanish. A confirmatory factor analysis (CFA), graded response model was used to estimate the discrimination (a) and difficulty (b) parameters of the items. Multi-group CFA was used to assess measurement invariance. Regarding validity based on the validity in relation to other variables, an explanatory model was proposed using the SEM path method. The unidimensional structure of the 10-item CIS was not confirmed. Therefore, it was suggested that a six-item model of the CIS (CIS-6) provides a better fit and reliable score. The multigroup CFA showed that the CIS-6 does not exhibit measurement invariance between males and females. In addition, the CIS-6 items present adequate discrimination and difficulty indices. A higher presence of the latent trait (in this case, perception of the impact of COVID-19) is required to answer the higher response categories. The findings would help to assess those individuals more prone to the impact of the COVID-19 pandemic and to have evidence for the development of interventions aimed at decreasing the impact.

Keywords: impact of COVID-19, COVID-19 pandemic, validity, invariance

INTRODUCTION

The COVID-19 pandemic poses challenges for the health system that requires a rapid response in a short period of time [1]. The rapid increase in confirmed cases and deaths from COVID-19 generated great concern and still represents a strong threat to global public health [2]. In the context of the pandemic, immediate, short-term attention has been paid to the negative mental health impacts of COVID-19; however, such attention must take a long-term view [3,4]. In this regard, it has been suggested that, as the COVID-19 pandemic ends, a "tsunami of psychiatric illness" is emerging [5]. This is due to the increase in mental health disorders in the general population as a result of the prolonged effects of the pandemic, restrictive measures, and the socioeconomic consequences of the pandemic [6]. Therefore, different studies have supported the presence of an ascending emotional epidemic curve, which expresses a higher probability of mental health problems in the post-pandemic period [7,8].

A systematic review and meta-analysis study indicated the presence of significant, but statistically small increases in mental health symptoms, being larger and more persistent for depressive symptoms, compared to smaller variations in anxiety symptoms [9]. Another study estimated that during the pandemic depressive symptoms increased by approximately 23% and feelings of loneliness by 4%, but no effects on anxiety were detected. In addition, impairment of social relationships was strongly and negatively related to increased mental health problems [10].

In recent years, specific scales have been developed to assess psychological problems resulting from the COVID-19 pandemic, such as COVID-19 fear [11], COVID-19 anxiety [12], COVID-19 stress [13], pandemic grief [14], or COVID-19 phobia [15], some of which have been translated into Spanish and validated in the Peruvian context, such as the pandemic grief scale [16], fear of COVID-19 scale [17], coronavirus anxiety scale [18], COVID stress scales [19], among others. While these instruments measure important emotional responses characteristic of the early phases of the pandemic, there is a need for instruments that can provide information on changes in these emotional responses as the pandemic has progressed. In this regard, the COVID-19 impact scale (CIS) [20], which aims to measure psychological stress responses produced by the COVID-19 pandemic, including emotional responses and difficulty performing activities of daily living. In this way, the CIS would allow tracking of emotional and daily living problems that may persist after the COVID-19 pandemic. The initial psychometric analysis of the CIS [20], indicated the presence of a unidimensional structure, by means of an exploratory factor analysis, which showed an excellent fit of the data, by means of confirmatory factor analysis (CFA). In addition, the CIS showed positive correlations with the presence of depressive symptoms, anxiety, suicidal ideation, and fear of COVID-19; whereas it correlated negatively with subjective well-being.

The initial psychometric study of the CIS [20], was conducted on the basis of classical test theory (CTT), which is the most traditional method for evaluating the properties of a scale. This method considers the scales as a whole, based on correlations and assuming that all the items that make up a scale are equal indicators of the construct to be measured [21]. On the other hand, item response theory (IRT), allows estimating not only the measured construct level of a person, but also inquiries about the properties of each of the test items. Specifically, IRT models evaluate the relationship between the properties of each of the items of a scale, the individual's responses to those items, and the latent trait to be measured [22]. In this sense, it is assumed that the latent trait and item performance are part of a continuum; therefore, the main objective of IRT is to indicate the position of an individual in that length [23]. Furthermore, the findings on psychometric evidence derived from IRT are not influenced by the characteristics of the sample, as evidence based on CTT is. It has been suggested that scales developed under IRT models tend to be more accurate in assessing psychological change than those developed solely on the basis of CTT [24]. IRT models would allow the identification of subtle changes that might be difficult to detect if only the total item scores were used. Therefore, the use of models derived from TCT and IRT would allow the integration of findings from modern and traditional methods for a better understanding of the psychometric evidence of a scale.

Also, because the CIS was developed recently, no evidence of measurement invariance (MI) between different groups was provided. Recently, the International Test Commission (ITC) gave new guidelines for test adaptation from one culture to another, including providing empirical information on construct equivalence among all populations involved and establishing a level of comparability between scores from different populations using appropriate methods [25]. However, although these patterns are known, they are not frequently used. MI is a property that indicates whether an instrument measures the same latent construct among different subgroups within a sample [26]. Establishing MI is a prerequisite for making meaningful comparisons between groups and identifying whether differences in scores on an instrument, such as the CIS, detect true differences between subgroups [27,28]. Having evidence of MI from the CIS would allow information to assess and compare the true differences in the impact of COVID-19 on emotional reactions and performance of activities of daily living among different subsamples. Thus, different findings between subgroups (e.g., men vs. women) could be used to help them identify how best to cope with the emotional impact of the pandemic.

Given the need to have a measure of negative emotions and the deterioration in quality of life resulting from the COVID-19 pandemic in Spanish, the aim of this study was to translate and evaluate the psychometric evidence of the Spanish version of the CIS in the general population of Peru, based on CTT and IRT methods. The findings derived from the CTT in the present study may help to corroborate previous evidence on the psychometric properties of the CIS; whereas the findings based on the IRT may provide a new and improved perspective on the psychometric properties. Specifically, validity evidence based on internal structure and relationship to other variables, reliability, MI, and item discrimination and difficulty parameters will be evaluated. It is expected that the CIS will maintain a unidimensional structure and an excellent estimate of reliability, as in the original study [20]. In addition, the CIS is expected to be positively and significantly related to fear of COVID-19, as noted above [20]. While the original CIS study did not assess item characteristics based on the IRT, it is expected that they will have adequate discrimination and difficulty parameters just like other mental health measures during the pandemic [16,18]. Similarly, while there is no previous evidence of MI with the CIS, it is expected to have an invariant measure when comparing groups of men and women, as with other measures of mental health [18]. This would allow comparison of the impact of the pandemic on emotional reactions and daily activities in men and women without the presence of bias. It has been suggested that the COVID-19 pandemic has impacted more negatively on women than men [29,30].

METHOD

Participants

The participants were 601 Peruvians selected by non-probabilistic sampling. The inclusion criteria to be part of the sample were, as follows:

1. To be over 18 years of age,
2. To be Peruvian by birth, and
3. To have given informed consent.

Initially, a minimum number of 200 people was proposed, which is considered an adequate sample size for psychometric studies [31]. Likewise, the number of participants was in accordance with the recommendations for studies that perform CFA and IRT models, which require minimum sample sizes of between 300 and 375, respectively [32, 33]. The final number of participants significantly exceeded the recommended minimum. The majority of participants were between 18 and 29 years of age (82%), female (62.9%), single (81%), university educated (62.4%), with an income of less than

Table 1. Characteristics of the sample under study

	n	%
Age		
18 to 29 years	493	82.0
30 to 66 years	108	18.0
Sex		
Female	378	62.9
Male	223	37.1
Marital status		
Single	487	81.0
Married	67	11.1
Widower	2	0.3
Divorced	45	7.5
Academic degree		
Primary	2	0.3
Secondary	77	12.8
Technical	147	24.5
Higher	375	62.4
Economic income		
<930 soles	290	48.3
930 soles	84	14.0
Between 1,000 and 2,000 soles	157	26.1
Between 2,000 and 4,000 soles	49	8.2
Between 4,000 nd 6,000 soles	11	1.8
More than 6,000 soles	10	1.7
Suffer from a chronic disease		
Yes	50	8.3
No	551	91.7
Exposure time to information on COVID-19 (hours)		
1 to 3 hours	465	77.4
3 to 5 hours	69	11.5
5 to 7 hours	30	5.0
More than 7 hours	37	6.2
Source of information on COVID-19		
Official government sources	172	28.6
Family members or friends	46	7.7
Social networks (Facebook, Instagram)	221	36.8
Television, radio, and the written press	162	27.0
Vaccinated against COVID-19		
Yes	593	98.7
No	8	1.3
Had COVID-19		
Yes	255	42.4
No	179	29.8
I do not know but I don't think so	131	21.8
I do not know but I think so	36	6.0
Death of a relative by COVID-19		
Yes	363	60.4
No	238	39.6

2,000 soles (88.4%). Likewise, 91.7% indicated that they did not suffer from any chronic disease and 77.4% were exposed to information on COVID-19 between 1 to 3 hours per week. Most reported that their main sources of information were official government channels (28.6%) and social networks (36.8%). Finally, 98.7% indicated having been vaccinated against COVID-19, 42.4% were diagnosed with the disease, and 60.4% suffered the death of a family member from COVID-19. Further details of the sociodemographic variables of the sample can be seen in **Table 1**.

Instruments

Sociodemographic questionnaire

An ad-hoc questionnaire was developed to obtain information on participants' sex, age, marital status, educational level, income, presence of chronic diseases, vaccination, death in the family, and COVID-19 diagnosis.

COVID-19 impact scale

The CIS was developed to measure different negative emotions and quality of life impairment caused by the COVID-19 pandemic. The CIS is comprised of 10 items that have five response options in a Likert-type format where, 0=none, 1=mildly/rarely, 2=moderately/sometimes, 3=severely/often and 4=very severe/very often. The sum of the scores for each of the items results in a total CIS score, where higher scores would indicate a greater impact of COVID-19 on emotional reactions and quality of life.

The CIS was originally developed in English; therefore, the cultural adaptation and translation was carried out in different stages, following standardized criteria [34]. First, two independent translators translated the CIS from English into Spanish, obtaining two preliminary versions (T1 and T2). Second, these two initial versions were merged (T3).

This new version (T3) was evaluated by a team composed of two psychologists with expertise in clinical psychology and two experts in psychometric research. This team evaluated and resolved possible doubts in T3, after which a new version (T4) was obtained. Third, T4 was translated from Spanish to English by two other independent, native English translators (T5 and T6). The research team evaluated T5 and T6, obtaining a final version (T7) and comparing it with the original English version. It was indicated that the items of T7 showed matches with the original English version. Fourth, the T7 was administered to a small sample of people (n=25), who indicated that the items were easy to understand **Table 2** shows the original version of the CIS in English and the final version in Spanish.

Fear of COVID-19 scale

The FCV-19S is a unidimensional scale that measures symptoms of fear of COVID-19. In this study, we used the Spanish version adapted and validated in seven Latin American countries [35], composed of seven items (e.g., item 6 states "I cannot sleep because I worry about having COVID -19") and is rated on a 5-alternative scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

The seven items have also been distributed in a model with two related factors (emotional and physiological). The total score is calculated from the sum of the scores of all items. Thus, the total score can range from seven to 35, with higher scores expressing higher levels of fear of COVID-19.

Procedure

The data was collected through the online survey platform Google Form between April 2 and April 28, 2022. The online survey was disseminated via emails and social networks, such as Facebook. All individuals gave informed consent prior to data collection and after reading the objectives of the study and the general conditions of their participation.

Participation was voluntary without receiving any financial compensation. Responding to the survey took between five and 10 minutes. The study was approved by the Ethics Committee of the university where the main author of the study works (Universidad Privada del Norte), and the procedures used complied with its ethical standards (registration number: 20213002).

Table 2. Original English version and Spanish version of the CIS

Original English version of the CIS	Spanish version of the CIS
1. Please indicate how much your current life is affected by the COVID-19 related problems.	1. Indique cuánto se ve afectada su vida actual por los problemas relacionados con la COVID-19.
2. Please indicate how much your current quality of life is damaged by the COVID-19 related problems.	2. Indique cuánto daña su calidad de vida actual los problemas relacionados con la COVID-19.
3. How much are you worried about the COVID-19 related problems currently?	3. ¿Cuánto le preocupan actualmente los problemas relacionados con la COVID-19?
4. How often are you experiencing stress regarding the COVID-19 related problems currently?	4. ¿Con qué frecuencia experimenta estrés con respecto a los problemas relacionados con la COVID-19 actualmente?
5. How much are you experiencing fatigue regarding the COVID-19 related problems currently?	5. ¿Cuánto está experimentando fatiga con respecto a los problemas relacionados con la COVID-19 actualmente?
6. How much are you depressed by the COVID-19 related problems currently?	6. ¿Cuánto está deprimido actualmente por los problemas relacionados con la COVID-19?
7. How often are you experiencing irritation regarding the COVID-19 related problems currently?	7. ¿Con qué frecuencia experimenta irritación con respecto a los problemas relacionados con la COVID-19 actualmente?
8. How often are you experiencing anger regarding the COVID-19 related problems currently?	8. ¿Con qué frecuencia experimenta ira con respecto a los problemas relacionados con la COVID-19 actualmente?
9. How much do the COVID-19 related problems interfere with your interpersonal relationship?	9. ¿Cuánto interfieren los problemas relacionados con la COVID-19 en su relación interpersonal?
10. How much do the COVID-19 related problems interfere with your studies, work, or household chores?	10. ¿Cuánto interfieren los problemas relacionados con la COVID-19 en sus estudios, trabajo o tareas del hogar?

Table 3. Descriptive analysis of the items

Items	Mean	Standard deviation	Skewness	Kurtosis
1	1.89	1.07	.07	-.52
2	1.98	1.08	.03	-.51
3	2.19	1.07	-.20	-.48
4	1.79	1.11	.20	-.63
5	1.55	1.14	.33	-.70
6	1.40	1.18	.48	-.68
7	1.44	1.14	.45	-.58
8	1.35	1.15	.53	-.56
9	1.52	1.11	.33	-.63
10	1.87	1.18	.13	-.85

Data Analysis

To perform the CFA, the diagonally weighted least squares with mean and variance corrected (WLSMV) estimator was used since the items are at ordinal level [36]. The evaluation of model fit was performed based on the RMSEA, SRMR, CFI, and TLI indices. RMSEA and SRMR values less than .08 were considered acceptable [37]; whereas CFI and TLI values greater than .95 were considered adequate [38]. The reliability of the scale was estimated with Cronbach's alpha [39] and omega [40] coefficients, where a value >.80 is adequate [41].

Regarding the IRT, a graded response model [42] was used, specifically an extension of the two-parameter logistic model (2-PLM) for ordinal polytomous items [43]. To estimate model fit, the C2 test developed for ordinal items was used [44] and the following fit criteria were used: RMSEA ≤ .08 and SRMSR ≤.05 [45]. CFI and TLI values were also considered using the same fit criterion (≥.95) employed in CFA models, as suggested by the scientific literature [46,47].

Two types of parameters were estimated for all items: discrimination (a) and difficulty (b). Three thresholds were estimated for parameter b since the items have four response categories. The estimates for these three thresholds indicate the level of the latent variable at which an individual has a 50% chance of scoring at or above a particular response category. Item information curves (IIC) and the scale information curve (SIT) were also calculated.

To evaluate the factorial invariance of the scale according to sex, multigroup CFA (MGCFA) was used, where a sequence of four hierarchical variance models was proposed, as follows:

1. Configural invariance (reference model),
2. Metric invariance (equality of factor loadings),
3. Scalar invariance (equality of factor loadings and intercept), and
4. Strict invariance (equality of factor loadings, intercept, and residuals).

To compare the sequence of models, first a formal statistical test was employed, for which the chi-square difference ($\Delta\chi^2$) was used, where nonsignificant values (p>.05) suggest invariance between groups. Secondly, a modeling strategy was employed, for which the differences in CFI (ΔCFI) was used, where differences less than <.010 evidence model invariance between groups [48]. Regarding validity based on the relationship with other variables, an explanatory model was proposed using the SEM Path method. This model proposes that a set of sociodemographic variables has a significant impact on the level of fear of COVID-19. In turn, it is hypothesized that this variable significantly predicts the perceived impact of COVID-19. The WLSMV estimator was used to estimate the model and the same adjustment indicators used in the CFA were considered. For the statistical analysis, the RStudio environment for R was used. Specifically, the "lavaan" package [49] was used to perform the AFC and the SEM Path model, the "semTools" package [50] to perform factorial invariance and "mirt" package for the IRT models [51].

RESULTS

Descriptive Analysis

Table 3 shows that item 2 ("How concerned are you currently about problems related to COVID-19?") has the highest average score in the sample. That is, most participants are moderately concerned about the problems associated with COVID-19. It is also noticeable that item 8 ("How often do you experience anger regarding problems related to COVID-19 currently?") presents the lowest mean score, i.e., most

Table 4. Parameters and fit indices of the items and fit indices of the GRM model

Model	Item	CIS-10 parameters					CIS-6 parameters				
		a	b_1	b_2	b_3	b_4	a	b_1	b_2	b_3	b_4
Perceived impact of COVID-19	1	1.70	-1.83	-.47	.99	2.35	-	-	-	-	-
	2	1.79	-1.94	-.58	.84	2.04	-	-	-	-	-
	3	1.31	-2.49	-1.03	.59	2.21	-	-	-	-	-
	4	2.47	-1.40	-.19	.89	1.89	2.96	-1.36	-.17	.89	1.75
	5	2.83	-.94	.10	1.06	2.15	2.84	-.97	.21	1.13	2.08
	6	3.73	-.65	.27	1.11	1.95	3.73	-.55	.32	1.09	2.01
	7	3.73	-.77	.21	1.15	1.99	3.72	-.73	.28	1.17	1.97
	8	2.90	-.65	.35	1.27	2.18	3.57	-.56	.38	1.22	2.14
	9	2.61	-.95	.13	1.19	2.24	2.64	-.99	.10	1.15	2.21
	10	1.67	-1.49	-.22	.89	2.06	-	-	-	-	-

Note. A: Discrimination parameters & b: Difficulty parameters

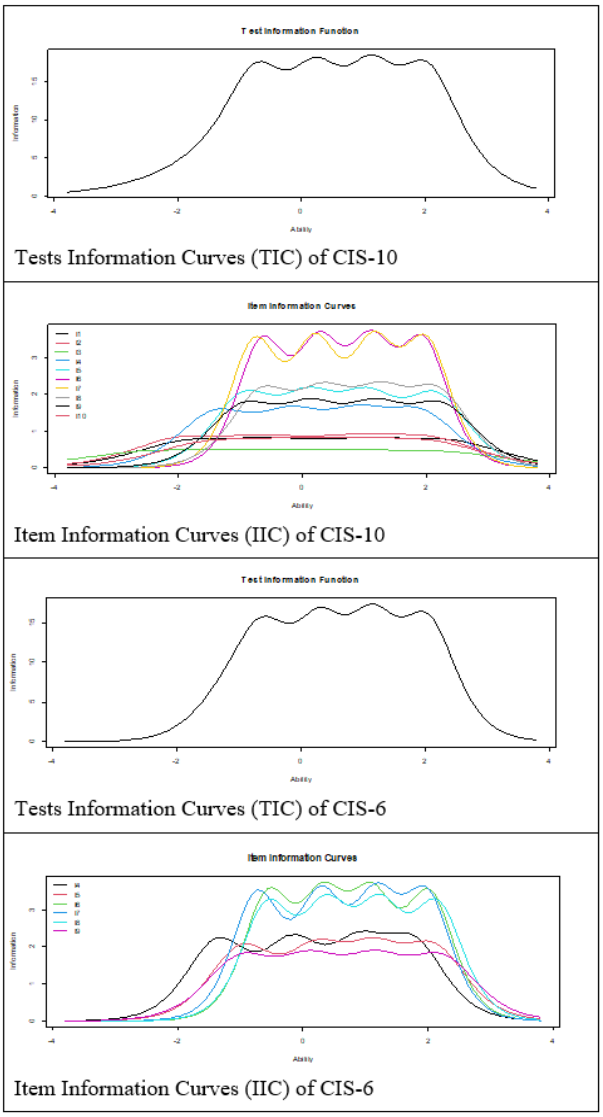

Figure 1. Item and test information curves for the CIS

participants indicate that they rarely experience anger. It is also observed that all items present skewness and kurtosis values within the expected limits (As <±2; Ku <±7), according to Finney and DiStefano criteria [52].

Validity based on internal structure

It was found that the unidimensional ten-item model did not show adequate fit indices to the data (χ^2=871.23; df=35; CFI=.96; TLI=.94; RMSEA=.200 [CI 90% .188-.211]). Therefore, a

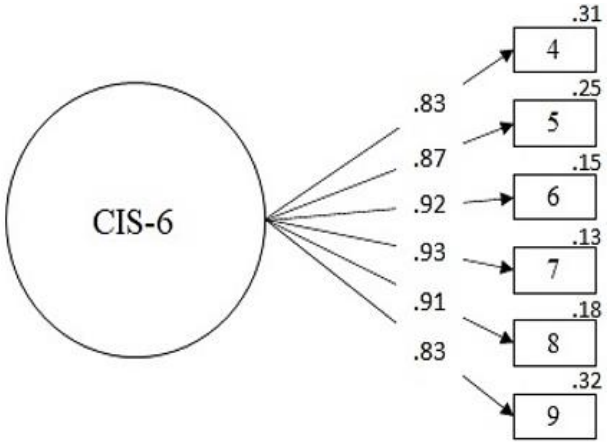

Figure 2. Confirmatory factor analysis of CIS-6

second model was evaluated using the item parcels method, i.e., the sum of the averages of the items was used. The same number and composition of item parcels was used as in the original scale study: parcel one (items 1 and 2), parcel two (items 3 and 4), parcel three (items 5, 6, 7, and 8) and parcel four (items 9 and 10). This second model did not present adequate fit indices (χ^2 53.50; df=2; CFI=.95; TLI=.85; RMSEA=.237 [CI 90% .185-.294]). In addition, it presented a worse fit compared to the original model.

Item calibration with the GRM (2-PML)

Table 4 shows the discrimination and difficulty parameters of the items of the ten-item scale (CIS-10). In the model, although most of the items presented high levels of discrimination, items 1, 2, 3, and 10 presented the lowest levels of discrimination. This can be clearly seen in **Figure 1**, where the slope of the IIC curve of the four items is almost nonexistent. Therefore, it was decided to eliminate these items from the scale.

In the new version of the scale (CIS-6), all items presented adequate discrimination indices (see **Table 4**). Regarding the difficulty parameters, all threshold estimators increased monotonically. It is important to note that the estimated GRM model presented adequate fit indices (C2[df]=98.18[9]; p<.01; RMSEA=.128; SRMSR=.034; TLI=.97; CFI=.98).

Figure 2 shows the information curves of the items and the scale (IIC and ICT respectively). The IIC shows that items 6, 7, and 8 are the most accurate for assessing the construct. In addition, the ICT shows that the factor is more reliable (accurate) in the range of the scale between -1 and 2.5.

Table 5. PRI+15 model fit indices and invariance indices by gender

One-dimensional model	χ^2	df	p-value	SRMR	TLI	CFI	RMSEA [CI 90%]	$\Delta\chi^2$	Δdf	p-value	ΔCFI
Total sample											
Model CIS-6	138.55	9	.000	.029	.99	.99	.155 [.133-.178]	-	-	-	-
According to sex											
Male	53.51	9	.000	.027	.99	.99	.149 [.112-.189]	-	-	-	-
Female	110.18	9	.000	.036	.98	.99	.173 [.145-.202]	-	-	-	-
Configural	65.74	18	.000	.026	.94	.96	.094 [.070-.119]	-	-	-	-
Metric	51.87	23	.001	.031	.97	.98	.065 [.041-.088]	5.71	5	.334	-.015
Scalar	72.92	28	.000	.036	.96	.96	.073 [.053-.094]	17.54	5	.004	-.013
Strict	71.37	34	.000	.040	.97	.97	.061 [.041-.080]	7.29	6	.294	.006

Note: Modelo 1: Modelo de tres dimensiones relacionadas con quince ítems [Model 1: Model of three dimensions related to fifteen items]; χ^2: Chi-square; df: Degrees of freedom; SRMR: Standardized root mean square residual; TLI: Tucker-Lewis index; CFI: Comparative fit index; RMSEA: Root mean square error of approximation; $\Delta\chi^2$: Differences in Chi-square; Δdf: Differences in degrees of freedom; ΔRMSEA: Change in root mean square error of approximation; & ΔCFI: Change in comparative fix index

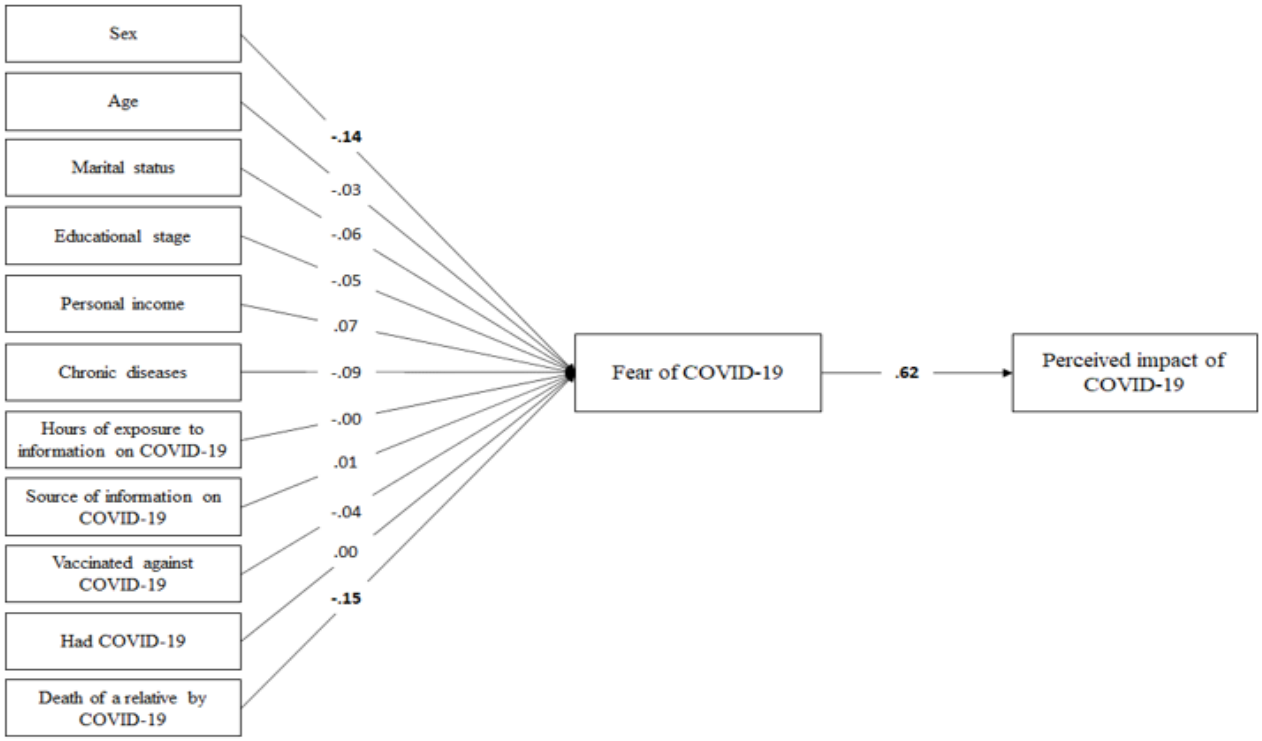

Figure 3. Explanatory model of the perceived impact of COVID-19

Factorial Invariance

Table 3 shows that the new CIS-6 version, from the perspective of the AFC, presented adequate fit indices (χ^2=138.55; df=9; CFI=.99; TLI=.99; RMSEA=.155 [CI 90% .133-.178]). As can be seen in **Figure 2**, the factorial weight of all its items was high (>.80) and presents very excellent reliability indices (α=.94; ω=.95). Therefore, this new version was used to study the invariance of the scale and other statistical procedures.

Table 5 shows that the factor structure of the scale did not show evidence of being strictly invariant for the male and female groups in the sequence of invariance models proposed: metric (ΔCFI=-.015), scalar (ΔCFI=-.013) and strict (ΔCFI=.006) invariance.

Explanatory model of the perceived impact of COVID-19

Based on the literature review, an SEM analysis was performed to evaluate the degree of prediction of fear of COVID-19 on the perceived impact of COVID-19. At the same time, it was evaluated whether some sociodemographic variables were able to explain a higher level of fear of COVID-19. Initially, it was evident that the measurement models for both fear of COVID-19 (χ^2=24.02; df=7; CFI=.99; TLI=.97; RMSEA=.073 [CI 90% .042-.105]) and perceived impact of COVID-19 (χ^2=138.55; df=9; CFI=.99; TLI=.99; RMSEA=.155 [CI 90% .133-.178]) fit the data adequately. With respect to the structural model, it was evident that it presented adequate fit indices to the data (χ^2=28.31; df=11; p=.003; RMSEA=.050 [CI 90% .028-.073]; CFI=.95; TLI=.90).

Figure 3 shows that sex significantly and negatively predicts fear of COVID-19 (-.14; p<.01), specifically women are related to a higher level of fear of COVID-19. Similarly, having lost or not having lost a family member significantly and negatively predicts fear of COVID-19 (-.15; p<.01). Specifically, having lost a family member is related to a greater fear of COVID-19. With respect to the other sociodemographic variables, it was found that they did not significantly predict fear of COVID-19. Finally, fear of COVID-19 significantly and positively predicts the perceived level of impact of COVID-19 (.62; p<.01).

DISCUSSION

Since the COVID-19 pandemic became a public health issue [2], a large number of studies have been developed to develop and validate instruments that would track mental health problems that may persist after the COVID-19 pandemic. Therefore, this study aimed to translate and validate the CIS to measure the degree of impact COVID-19 has on people's emotional reactions and daily activities following the pandemic.

The results of the CFA indicated that the original single-factor CIS model did not show adequate fit indices to the data. Even after evaluating a second model with the item-plot method, good fit rates were not obtained. Although at this stage it was possible to choose to evaluate models with correlated errors, it was not decided to use this procedure because it can generate an overestimation or underestimation of reliability, due to the presence of variance not associated with the construct, which can produce a bias in the interpretation of the accuracy of the CIS [53]. In this sense, it was decided to evaluate the discrimination and difficulty parameters of the items of the ten-item CIS scale to identify those items that presented high and low levels of discrimination. Indeed, items 1, 2, 3, and 10 presented the lowest levels of discrimination, which leads to the assumption that these items have a low power to distinguish between people who have had a high and low impact of COVID-19. Therefore, it was decided to remove these items from the scale. The four items removed from the CIS refer to the impact of the pandemic on very general aspects such as current life (item 1) and overall quality of life (item 2), unspecified problems associated with the pandemic (item 3) and problems in different areas such as study, work, or home (item 10). It has been suggested that having instruments whose items measure general aspects of mental health may lead to underdiagnosis or overdiagnosis [54]. Therefore, it is important to have instruments with items designed to identify specific mental health problems related to COVID-19, such as symptoms of stress, fatigue, depression, irritation, anger, and interpersonal relationship problems generated by the pandemic, as is the case with the six items that presented better levels of discrimination. These six items gave rise to a new, shorter version of the CIS (CIS-6). The presence of these six items in this new version is to be expected since symptoms of depression and stress are among the most characteristic during the pandemic worldwide, with a prevalence of 28.18% and 25.18% respectively [55]. In Peru, between 18.1% and 39% of people have presented symptoms of depression; while 15% stress symptoms [56, 57]. Regarding the other symptoms, anger has shown a prevalence of 24.5% [58]; while irritability is a central symptom for the future onset of depression and anxiety disorders [59]. Finally, for some people the pandemic has changed interpersonal relationships, caused by fear and uncertainty about what is the right thing to do/not to do, associated with the ambiguous and contradictory information we have received [60].

The elimination of some items from the original version of the CIS suggests that the representativeness of the construct with the items may be conditioned by cultural variations between the Korean sample of the original study and the Peruvian sample of the Spanish adaptation. This lack of consistency in the results has also been observed in other international studies that have adapted instruments to measure mental health symptoms from one language to another during the pandemic, in which there are differences between countries with respect to the relevance of the items [35]. The new six-item model (CIS-6) presented better fit indices, except for the RMSEA value, which was higher than allowed. However, this is to be expected in factor models with low degrees of freedom, as is the case of the six-item model. In this type of factorial models, the RMSEA tends to present a low performance, despite being correctly specified [61, 62]. In this sense, it would be erroneous to discard a factorial model that has a higher RMSEA value than suggested with small degrees of freedom, without considering the information derived from other fit indices or factor loadings, which in this study were high. On the other hand, the reliability of the CIS-6 was excellent, with alpha and omega coefficient values above .90, which is slightly above that indicated in the full version of the CIS-6 [20]. This would suggest that the reduction of items did not imply a decrease in reliability in the CIS-6. As mentioned earlier, having a measure with fewer items would allow for greater savings in evaluation time and related costs [23], improved response rates [24], and a decrease in fatigue and other negative reactions [25].

In addition to the good properties shown in the previous findings, all items of the CIS-6 presented adequate discrimination indices, thus allowing to differentiate between individuals efficiently and clearly with low and high levels of COVID-19 impact on emotional reactions and daily activities [63]. Likewise, item difficulty ratings were acceptable, indicating that the six CIS-6 items explain a wide range of levels of COVID-19 impact on mental health and daily activities. Similarly, since all threshold estimators increased monotonically, a greater presence of the latent trait (in this case, perception of the impact of COVID-19) is required to answer the higher response categories.

Despite the good fit indices of the CIS-6 and adequate discrimination and difficulty parameters, the factor structure did not show evidence of being strictly invariant between men and women. That is, men and women understand differently the perception of the impact of the pandemic on emotional reactions and daily activities. This would indicate that there are differences in the responses to the CIS-6 items that influence the score, regardless of the level of the latent variable. Therefore, it appears that the structure and/or overt indicators of the impact of COVID-19 on emotional reactions and daily activities, as measured by the CIS-6, may not be the same between male and female groups in Peru. Ignoring the non-invariance of the CIS-6 in research and clinical work could generate biased estimates, invalidating the findings of the comparisons made between sexes. At this point, it was possible to identify the parameters of the non-invariant items through a re-evaluation of the model fit after eliminating the equality restrictions for some parameters, such as factor loadings, and obtaining partial invariance. However, there are questions about the usefulness of partial invariance, since, being a subset of a scale, it would significantly alter the construct being measured. In addition, partial invariance limits meaningful comparisons of group mean to the means calculated on these items. Finally, the problems of underrepresentation of the construct will lead to the interpretation of scores of a partially invariant measure only if it has adequate theoretical support.

Results on validity evidence based on the relationship with other variables indicated that, fear of COVID-19 significantly and positively predicted the level of perceived impact of

COVID-19. In this sense, people with higher levels of fear of COVID-19 perceived that the pandemic had a greater impact on their mental health and activities of daily living. This is to be expected since fear is one of the most prevalent psychological responses during pandemic diseases [11]. In addition, a recent meta-analysis study indicated that fear of COVID-19 was strongly related to anxiety, traumatic stress, distress, and moderately related to stress and depression [64]. Similar results have been reported in Latin America, where fear of COVID-19 was related to higher levels of anxiety and depression [65]. This finding demonstrates that fear of COVID-19 could worsen people's mental health [66]. In the context of the pandemic, the uncertainty generated by the disease and its future development, the perception of lack of control over the pandemic, the fear of becoming infected, misinformation and economic problems indicate the presence of fear [67, 68]. The evidence of the relationship between the perceived impact of the COVID-19 pandemic and fear of COVID-19 is important because a negative impact decreases well-being and quality of life, even more so in situations such as the COVID-19 pandemic.

Additionally, the model of the relationship between variables reported that sex, specifically being female, significantly, and negatively predicts fear of COVID-19. This finding agrees with previous studies conducted in other Latin American countries [69, 70]. One possible explanation is that women generally exhibit greater reactivity in the neural networks associated with fear responses than men [71]. In addition, it has also been suggested that hormonal variations in the female reproductive cycle tend to alter the behavior of the hippocampus and the hypothalamic-pituitary-adrenal axis, which are structures associated with fear physiology [72]. Similarly, it has been reported that women have more negative perceptions of health risks during the pandemic compared to men, which may be mediated by gender stereotypes [73]. Likewise, having lost a family member is related to a greater fear of COVID-19, which is consistent with previous studies [74-76]. This would seem to suggest that personally relevant situations during the pandemic, such as personal loss of family members, would affect coping potential and other important psychological resources to overcome the potential threat posed by the pandemic [77].

While the study has important findings, based on the use of classical and modern methods, it also has some limitations. First, self-report measures were used to assess the impact of COVID-19 and fear of COVID-19, which generates the presence of possible social desirability biases, memory recall biases, or other method biases. Thus, future studies should use other techniques that allow for more in-depth analysis. Second, we used non-probabilistic convenience sampling, which limits the generalizability of the findings to the entire general population of Peru. Third, the online nature of the survey also limited the study to people from different strata of the population who did not have access to the Internet or older adults with little experience in this type of survey. Fourth, the sample consisted mostly of women, which could also affect the generalizability of the findings. The last three limitations lead us to consider that future studies should use nationally representative samples to confirm the findings reported here. Fifth, the sample size of 228 may not be sufficiently representative; however, the number was sufficient to perform the psychometric analyses in accordance with the literature. Sixth, there was no information on whether the participants had any diagnoses of psychiatric disorders, such as depression and anxiety. This justifies evaluating the psychometric properties of the CIS in clinical samples, as well as testing its sensitivity and specificity with the aim of improving the applicability of the scale in different contexts. Seventh, the study had a cross-sectional design; therefore, the relationships reported between the different variables do not provide causal information. In this sense, future studies should include longitudinal designs to assess the relationships between sociodemographic variables, fear of COVID-19, and the impact of the pandemic on emotional reactions and activities of daily living. Eighth, the stability of the CIS-6 over time was not assessed. This would lead to the incorporation of test-retest reliability measures. Finally, the participants were from a single South American country, whereas previous studies have indicated the importance of conducting cross-cultural invariance studies of mental health measures during the pandemic among different countries in Latin America and the Caribbean [17,18]. Therefore, it is necessary to evaluate the psychometric evidence of the CIS-6 across different countries or languages for an effective use of the scale in clinical practice and research.

The COVID-19 pandemic has generated mental health problems worldwide. Therefore, the development and validation of a measure of the impact of the COVID-19 pandemic on emotional reactions and activities of daily living as the pandemic ends is warranted. The present study allows us to conclude that the CIS-6 presented adequate evidence of validity based on internal structure and the relationship with other variables, as well as very good reliability. However, there was no evidence of MI between men and women. Despite the limitations, the findings support the utility of the CIS-6, as well as having important implications in clinical and research settings. First, studies conducted during, and post-pandemic COVID-19 would benefit from including an assessment of the impact of the pandemic on mental health and daily activities, not only as an outcome measure, but as a possible explanatory factor associated with potential vulnerability to disease. This would help professional decision makers to assess those individuals most prone to the impact of the COVID-19 pandemic and to have evidence for the development of interventions aimed at decreasing the impact. In this way, it is hoped to fill a methodological gap for the identification and monitoring of the impact of COVID-19 on emotional reactions and daily activities.

Author contributions: All authors have sufficiently contributed to the study and agreed with the results and conclusions.

Funding: No funding source is reported for this study.

Ethical committee approval: The study was approved by the Ethics Committee of the university where the main author of the study works (Universidad Privada del Norte), and the procedures used complied with its ethical standards (registration number: 20213002).

Declaration of interest: No conflict of interest is declared by authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

REFERENCES

1. Fiore E, Corbellini C, Acucella L, et al. Musculoskeletal pain related to COVID-19 survivors after hospitalization: A short review. Retos. 2022;44:789-95. https://doi.org/10.47197/retos.v44i0.90361

2. O'Brien N, Barboza-Palomino M, Ventura-León J, et al. Coronavirus disease (COVID-19). A bibliometric analysis. Rev Chil Anest. 2020;49(3):408-15. https://doi.org/10.25237/revchilanestv49n03.020
3. Sánchez Romero EA, Martínez Rolando L, Villafañe JH. Impact of lockdown on patients with fibromyalgia. Electron J Gen Med. 2022;19(3):em366. https://doi.org/10.29333/ejgm/11798
4. Belkin G, Appleton S, Langlois K. Reimagining mental health systems post COVID-19. Lancet Planet Health. 2021;5(4):e181-2. https://doi.org/10.1016/S2542-5196(21)00037-1
5. Tandon R. COVID-19 and mental health: preserving humanity, maintaining sanity, and promoting health. Asian J Psychiatr. 2020;51:102256. https://doi.org/10.1016/j.ajp.2020.102256 PMid:32586624 PMCid:PMC7305748
6. Galea S, Merchant RM, Lurie N. The mental health consequences of COVID-19 and physical distancing: the need for prevention and early intervention. JAMA Intern Med. 2020;180(6):817-8. https://doi.org/10.1001/jamainternmed.2020.1562 PMid:32275292
7. Ransing R, Adiukwu F, Pereira-Sanchez V, et al. Mental health interventions during the COVID-19 pandemic: A conceptual framework by early career psychiatrists. Asian J Psychiatr. 2020;51:102085. https://doi.org/10.1016/j.ajp.2020.102085 PMid:32413616 PMCid:PMC7195073
8. Ren FF, Guo RJ. Public mental health in post-COVID-19 era. Psychiatr Danub. 2020;32(2):251-5. https://doi.org/10.24869/psyd.2020.251 PMid:32796794
9. Robinson E, Sutin AR, Daly M, Jones A. A systematic review and meta-analysis of longitudinal cohort studies comparing mental health before versus during the COVID-19 pandemic in 2020. J Affect Disord. 2022;296:567-76. https://doi.org/10.1016/j.jad.2021.09.098 PMid:34600966 PMCid:PMC8578001
10. O'Donnell J, Cárdenas D, Orazani N, Evans A, Reynolds KJ. The longitudinal effect of COVID-19 infections and lockdown on mental health and the protective effect of neighbourhood social relations. Soc Sci Med. 2022;297:114821. https://doi.org/10.1016/j.socscimed.2022.114821 PMid:35219050 PMCid:PMC8847081
11. 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 Addict. 2020;1-9. https://doi.org/10.1007/s11469-020-00270-8 PMid:32226353 PMCid:PMC7100496
12. Lee SA. Coronavirus anxiety scale: A brief mental health screener for COVID-19 related anxiety. Death Stud. 2020;44(7):393-401. https://doi.org/10.1080/07481187.2020.1748481 PMid:32299304
13. Taylor S, Landry CA, Paluszek MM, Fergus TA, McKay D, Asmundson GJ. Development and initial validation of the COVID-19 stress scales. J Anxiety Disord. 2020;72:102232. https://doi.org/10.1016/j.janxdis.2020.102232 PMid:32408047 PMCid:PMC7198206
14. Lee SA, Neimeyer RA. Pandemic grief scale: A screening tool for dysfunctional grief due to a COVID-19 loss. Death Stud. 2022;46(1):14-24. https://doi.org/10.1080/07481187.2020.1853885 PMid:33349159
15. Arpaci I, Karatas K, Baloglu M. The development and initial tests for the psychometric properties of the COVID-19 phobia scale (C19P-S). Pers Individ Dif. 2020;164:110108. https://doi.org/10.1016/j.paid.2020.110108 PMid:32394993 PMCid:PMC7211675
16. Caycho-Rodríguez T, Vilca LW, Vivanco-Vidal A, et al. Assessment of dysfunctional grief due to death from COVID-19 in Peru: Adaptation and validation of a Spanish version of the pandemic grief scale. Trends Psychol. 2021;29(4):595-616. https://doi.org/10.1007/s43076-021-00091-1 PMCid:PMC8279032
17. Caycho-Rodríguez T, Tomás JM, Barboza-Palomino M, et al. Assessment of fear of COVID-19 in older adults: Validation of the fear of COVID-19 scale. Int J Ment Health Addict. 2022;20(2):1231-45. https://doi.org/10.1007/s11469-020-00438-2 PMid:33432265 PMCid:PMC7787591
18. Caycho-Rodríguez T, Vilca LW, Carbajal-León C, et al. Coronavirus anxiety scale: New psychometric evidence for the Spanish version based on CFA and IRT models in a Peruvian sample. Death Stud. 2022;46(5):1090-9. https://doi.org/10.1080/07481187.2020.1865480 PMid:33427098
19. Noe-Grijalva M, Polo-Ambrocio A, Gómez-Bedia K, Caycho-Rodríguez T. Spanish translation and validation of the COVID stress scales in Peru. Front Psychol. 2022;13:840302. https://doi.org/10.3389/fpsyg.2022.840302 PMid:35418905 PMCid:PMC8995497
20. Min H, Kim J, Moon K, Lee S, Kim JY, Ko YG. Development and validation of COVID-19 impact scale. BMC Psychol. 2022;10(1):1-10. https://doi.org/10.1186/s40359-022-00793-w PMid:35379349 PMCid:PMC8978488
21. Petrillo J, Cano SJ, McLeod LD, Coon CD. Using classical test theory, item response theory, and Rasch measurement theory to evaluate patient-reported outcome measures: A comparison of worked examples. Value Health. 2015;18(1):25-34. https://doi.org/10.1016/j.jval.2014.10.005 PMid:25595231
22. Steinberg L, Thissen D. Item response theory. In Comer JS, Kendall PC, editors. The Oxford handbook of research strategies for clinical psychology. Oxford University Press; 2013, p. 336-73. https://doi.org/10.1093/oxfordhb/9780199793549.013.0018
23. Van der Linden WJ, Hambleton RK. Handbook of modern item response theory. New York: Springer-Verlag; 1997. https://doi.org/10.1007/978-1-4757-2691-6
24. Jabrayilov R, Emons WH, Sijtsma K. Comparison of classical test theory and item response theory in individual change assessment. Appl Psychol Meas. 2016;40(8):559-72. https://doi.org/10.1177/0146621616664046 PMid:29881070 PMCid:PMC5978722
25. Hernández A, Hidalgo MD, Hambleton RK, Gómez Benito J. International test commission guidelines for test adaptation: A criterion checklist. Psicothema. 2020;32(3):390-8. https://doi.org/10.7334/psicothema2019.306
26. Brown TA. Confirmatory factor analysis for applied research. New York, NY: Guilford Press; 2015.
27. Gregorich SE. Do self-report instruments allow meaningful comparisons across diverse population groups? Testing measurement invariance using the confirmatory factor analysis framework. Med Care. 2006;44(11 Suppl 3):S78-94. https://doi.org/10.1097/01.mlr.0000245454.12228.8f PMid:17060839 PMCid:PMC1808350
28. Van de Schoot R, Lugtig P, Hox J. A checklist for testing measurement invariance. Eur J Dev Psychol. 2012;9(4):486-92. https://doi.org/10.1080/17405629.2012.686740

29. Gibson B, Schneider J, Talamonti D, Forshaw M. The impact of inequality on mental health outcomes during the COVID-19 pandemic: A systematic review. Can Psychol. 2021;62(1):101-26. https://doi.org/10.1037/cap0000272
30. Xiong J, Lipsitz O, Nasri F, et al. Impact of COVID-19 pandemic on mental health in the general population: A systematic review. J Affect Disord. 2020;277:55-64. https://doi.org/10.1016/j.jad.2020.08.001 PMid:32799105 PMCid:PMC7413844
31. VanVoorhis CW, Morgan BL. Understanding power and rules of thumb for determining sample sizes. Tutor Quant Methods Psychol. 2007;3(2):43-50. https://doi.org/10.20982/tqmp.03.2.p043
32. De Ayala RJ. The influence of multidimensionality on the graded response model. Appl Psychol Meas. 1994;18(2):155-70. https://doi.org/10.1177/014662169401800205
33. Tabachnick BG, Fidell LS. Using multivariate statistics. Boston: Allyn and Bacon; 2001.
34. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine. 2000;25(24):3186-91. https://doi.org/10.1097/00007632-200012150-00014 PMid:11124735
35. Caycho-Rodríguez T, Valencia PD, Vilca LW, et al. Cross-cultural measurement invariance of the fear of COVID-19 scale in seven Latin American countries. Death Stud. 2021;1-15. https://doi.org/10.1080/07481187.2021.1879318 PMid:33560185
36. Li CH. Confirmatory factor analysis with ordinal data: Comparing robust maximum likelihood and diagonally weighted least squares. Behav Res Methods. 2016;48(3):936-49. https://doi.org/10.3758/s13428-015-0619-7 PMid:26174714
37. Kline RB. Principles and practice of structural equation modeling. The Guilford Press; 2015.
38. Schumacker RE, Lomax RG. A beginner's guide to structural equation modeling: Fourth edition. Routledge; 2015. https://doi.org/10.4324/9781315749105
39. Cronbach LJ. Coefficient alpha and the internal structure of tests. Psychometrika. 1951;16(3):297-334. https://doi.org/10.1007/BF02310555
40. McDonald RP. Test theory: A unified treatment. Taylor & Francis; 1999.
41. Raykov T, Hancock GR. Examining change in maximal reliability for multiple-component measuring instruments. Br J Math Stat Psychol. 2005;58(1):65-82. https://doi.org/10.1348/000711005X38753 PMid:15969840
42. Samejima F. Graded response model. In van der Linden WJ, Hambleton RK, editors. Handbook of modern item response theory. New York: Springer; 1997; p. 85-100. https://doi.org/https://doi.org/10.1007/978-1-4757-2691-6_5
43. Hambleton RK, van der Linden WJ, Wells CS. IRT models for the analysis of polytomously scored data: Brief and selected history of model building advances. In Nering ML, Ostini R, editors. Handbook of polytomous item response theory models. New York: Routledge; 2010; p. 21-42.
44. Cai L, Monroe S. A new statistic for evaluating item response theory models for ordinal data. 2014. Available at: https://doi.org/10.4324/9781138609877-REE61-1 (Accessed: 15 June 2022).
45. Maydeu-Olivares A, Joe H. Assessing approximate fit in categorical data analysis. Multivariate Behav Res. 2014;49(4):305-28. https://doi.org/10.1080/00273171.2014.911075 PMid:26765800
46. Cai L, Chung SW, Lee T. Incremental model fit assessment in the case of categorical data: Tucker-Lewis index for item response theory modeling. Prev Sci. 2021;1-12. https://doi.org/10.1007/s11121-021-01253-4 PMid:33970410
47. Lubbe D, Schuster C. A graded response model framework for questionnaires with uniform response formats. Appl Psychol Meas. 2019;43(4):290-302. https://doi.org/10.1177/0146621618789394 PMid:31156281 PMCid:PMC6512163
48. Chen FF. Sensitivity of goodness of fit indexes to lack of measurement invariance. Struct Equ Modeling. 2007;14(3):464-504. https://doi.org/10.1080/10705510701301834
49. Rosseel Y. lavaan: An R package for structural equation modeling. J Stat Softw. 2012;48(2):1-36. https://doi.org/10.18637/jss.v048.i02
50. Jorgensen TD, Pornprasertmanit S, Schoemann AM, Rosseel Y. semTools: Useful tools for structural equation modeling. R package version 0.5-1; 2018. Available at: https://cran.r-project.org/package=semTools (Accessed: 15 June 2022).
51. Chalmers RP. Mirt: A multidimensional item response theory package for the R environment. J Stat Softw. 2012;48(6):1-29. https://doi.org/10.18637/jss.v048.i06
52. Finney SJ, DiStefano C. Nonnormal and categorical data in structural equation modeling. In Hancock GR, Mueller RO, editors. Structural equation modeling: A second course. IAP Information Age Publishing; 2013. p. 439-492.
53. Yang Y, Green SB. A note on structural equation modeling estimates of reliability. Struct Equ Modeling. 2010;17(1):66-81. https://doi.org/10.1080/10705510903438963
54. Ransing R, Ramalho R, Orsolini L, et al. Can COVID-19 related mental health issues be measured? Brain Behav Immun. 2020;88:32-4. https://doi.org/10.1016/j.bbi.2020.05.049 PMid:32470593 PMCid:PMC7248629
55. Mahmud S, Mohsin M, Dewan M, Muyeed A. The global prevalence of depression, anxiety, stress, and insomnia among general population during COVID-19 pandemic: A systematic review and meta-analysis. Trends Psychol. 2022;1-28. https://doi.org/10.1007/s43076-021-00116-9 PMCid:PMC8726528
56. Prieto-Molinaria DE, Bravo A, Gianella L, et al. Depresión y ansiedad durante el aislamiento obligatorio por el COVID-19 en Lima Metropolitana [Depression and anxiety during mandatory isolation by COVID-19 in Metropolitan Lima]. Liberabit. 2020;26(2):e425. https://doi.org/10.24265/liberabit.2020.v26n2.09
57. Virto-Farfan H, Ccahuana F, Bairo WL, et al. Estrés, ansiedad y depresión en la etapa inicial del aislamiento social por COVID-19, Cusco-Perú [Stress, anxiety, and depression in the initial stage of social isolation by COVID-19, Cusco-Peru]. Rev Cient Enferm. 2021;10(3):5-21.
58. Arora T, Grey I, Östlundh L, Lam KBH, Omar OM, Arnone D. The prevalence of psychological consequences of COVID-19: A systematic review and meta-analysis of observational studies. J Health Psychol. 2022;27(4):805-24. https://doi.org/10.1177/1359105320966639 PMid:33118376

59. Cai H, Bai W, Liu H, et al. Network analysis of depressive and anxiety symptoms in adolescents during the later stage of the COVID-19 pandemic. Transl Psychiatry. 2022;12(1):1-8. https://doi.org/10.1038/s41398-022-01838-9 PMid: 35273161 PMCid:PMC8907388
60. Pietrabissa G, Simpson SG. Psychological consequences of social isolation during COVID-19 outbreak. Front Psychol. 2020;11:2201. https://doi.org/10.3389/fpsyg.2020.02201 PMid:33013572 PMCid:PMC7513674
61. Kenny DA, Kaniskan B, McCoach DB. The performance of RMSEA in models with small degrees of freedom. Sociol Methods Res. 2015;44(3):486-507. https://doi.org/10.1177/0049124114543236
62. Taasoobshirazi G, Wang S. The performance of the SRMR, RMSEA, CFI, and TLI: An examination of sample size, path size, and degrees of freedom. J Appl Quant Methods. 2016;11(3):31-9. Available at: http://jaqm.ro/issues/volume-11,issue-3/pdfs/2_GI_SH_.pdf (Accessed: 15 June 2022).
63. Hays RD, Morales LS, Reise SP. Item response theory and health outcomes measurement in the 21st century. Med Care. 2000;38(9 Suppl):II28-42. https://doi.org/10.1097/00005650-200009002-00007 PMid:10982088 PMCid: PMC1815384
64. Simsir Z, Koc H, Seki T, Griffiths MD. The relationship between fear of COVID-19 and mental health problems: A meta-analysis. Death Stud. 2022;46(3):515-23. https://doi.org/10.1080/07481187.2021.1889097 PMid:33641626
65. Caycho-Rodríguez T, Tomás JM, Vilca LW, et al. Socio-demographic variables, fear of CoViD-19, anxiety, and depression: prevalence, relationships and explanatory model in the general population of seven Latin American countries. Front Psychol. 2021;12:4980. https://doi.org/10.3389/fpsyg.2021.695989 PMid:34803794 PMCid: PMC8602858
66. Satici B, Gocet-Tekin E, Deniz M, Satici SA. Adaptation of the fear of COVID-19 scale: Its association with psychological distress and life satisfaction in Turkey. Int J Ment Health Addict. 2021;19(6): 1980-8. https://doi.org/10.1007/s11469-020-00294-0 PMid:32395095 PMCid:PMC7207987
67. Shigemura J, Ursano RJ, Morganstein JC, Kurosawa M, Benedek DM. Public responses to the novel 2019 coronavirus (2019-nCoV) in Japan: Mental health consequences and target populations. Psychiatry Clin Neurosci. 2020;74(4):281-2. https://doi.org/10.1111/pcn.12988 PMid:32034840 PMCid:PMC7168047
68. Zandifar A, Badrfam R. Iranian mental health during the COVID-19 epidemic. Asian J Psychiatr. 2020;51:101990. https://doi.org/10.1016/j.ajp.2020.101990 PMid:32163908 PMCid:PMC7128485
69. Andrade EF, Pereira LJ, Oliveira APLD, et al. Perceived fear of COVID-19 infection according to sex, age and occupational risk using the Brazilian version of the fear of COVID-19 scale. Death Stud. 2022;46(3):533-42. https://doi.org/10.1080/07481187.2020.1809786 PMid:32845795
70. Broche-Pérez Y, Fernández-Fleites Z, Jiménez-Puig E, Fernández-Castillo E, Rodríguez-Martin BC. Gender and fear of COVID-19 in a Cuban population sample. Int J Ment Health Addict. 2020;1-9. https://doi.org/10.1007/s11469-020-00343-8 PMid:32837428 PMCid:PMC7292241
71. Liu N, Zhang F, Wei C, et al. Prevalence and predictors of PTSS during COVID-19 outbreak in China hardest-hit areas: Gender differences matter. Psychiatry Res. 2020;287:112921. https://doi.org/10.1016/j.psychres.2020.112921 PMid:32240896 PMCid:PMC7102622
72. McLean CP, Anderson ER. Brave men and timid women? A review of the gender differences in fear and anxiety. Clin Psychol Rev. 2009;29(6):496-505. https://doi.org/10.1016/j.cpr.2009.05.003 PMid:19541399
73. Alsharawy A, Spoon R, Smith A, Ball S. Gender differences in fear and risk perception during the COVID-19 pandemic. Front Psychol. 2021;12:689467. https://doi.org/10.3389/fpsyg.2021.689467 PMid:34421741 PMCid:PMC8375576
74. 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. 2020;289:113100. https://doi.org/10.1016/j.psychres.2020.113100 PMCid:PMC7227556
75. Kocak O, Kocak OE, Younis MZ. The psychological consequences of COVID-19 fear and the moderator effects of individuals' underlying illness and witnessing infected friends and family. Int J Environ Res Public Health. 2021;18(4):1836. https://doi.org/10.3390/ijerph18041836 PMid:33668655 PMCid:PMC7917729
76. Mertens G, Gerritsen L, Duijndam S, Salemink E, Engelhard IM. Fear of the coronavirus (COVID-19): Predictors in an online study conducted in March 2020. J Anxiety Disord. 2020;74:102258. https://doi.org/10.1016/j.janxdis.2020.102258 PMid:32569905 PMCid:PMC7286280
77. Taylor SE, Stanton AL. Coping resources, coping processes, and mental health. Annu Rev Clin Psychol. 2007;3:377-401. https://doi.org/10.1146/annurev.clinpsy.3.022806.091520 PMid:17716061