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Fear of COVID-19 scale: Validity, reliability and factorial invariance in Argentina's general population

Tomás Caycho-Rodríguez[a], Lindsey W. Vilca[b], Mauricio Cervigni[c,d,e,f], Miguel Gallegos[f,c,g], Pablo Martino[c,d,e,f], Nelson Portillo[h], Ignacio Barés[c,d,e], Manuel Calandra[c,d,e], and Carmen Burgos Videla[i]

[a]Facultad de Ciencias de la Salud, Universidad Privada del Norte, Lima, Perú; [b]Departamento de Psicología, Universidad Peruana Unión, Lima, Perú; [c]Facultad de Psicología, Universidad Nacional de Rosario, Rosario, Argentina; [d]Centro de Investigación en Neurociencias de Rosario, Facultad de Psicología, Universidad Nacional de Rosario, Rosario, Argentina; [e]Laboratorio de Cognición y Emoción, Facultad de Psicología, Universidad Nacional de Rosario, Rosario, Argentina; [f]Facultad de Ciencias de la Salud, Universidad Católica del Maule, Talca, Chile; [g]Consejo Nacional de Investigaciones Científicas y Técnicas, Buenos Aires, Argentina; [h]Lynch School of Education and Human Development, Boston College, Boston, Massachusetts, USA; [i]Instituto de Investigación en Ciencias Sociales y Educación, Universidad de Atacama, Atacama, Chile

ABSTRACT

This study evaluated the psychometric properties of the Scale of Fear of COVID-19 (FCV-19S) in a sample of 1,291 Argentines. The two-related factor structure of the FCV-19S had satisfactory goodness-of-fit indices using structural equation modeling and item response theory. Further results showed that the reliability was adequate, the factor structure was strictly invariable across age groups, and the model that evaluated the relationships between fear of COVID-19, anxiety, and depression had adequate goodness of fit indices as well. The results indicated that FCV-19S has strong psychometric properties to measure fear of COVID-19 in the general population of Argentina.

The COVID-19 pandemic is a major public health crisis affecting 188 countries, with more than 34.995.740 cases and 1.034.689 confirmed deaths to October 4, 2020, according to the Coronavirus Resource Center (2020). According to the same source, Argentina ranked 16th worldwide and 6th in Latin America with 260,911 cases and 5088 confirmed deaths. The pandemic not only affects physical health, but also has adverse consequences for mental health and well-being (Fiorillo & Gorwood, 2020), making it challenging for mental health professionals to perform their work (Xiang et al., 2020). The number of deaths and different measures taken by countries to contain the spread of the virus (e.g., isolation, social distancing, and quarantine) have increased people's feelings of loneliness, symptoms of anxiety and depression, sleep problems, alcohol and drug use, and fear and uncertainty (Roussel et al., 2020).

Excessive fear impairs rational thinking and leads to deterioration in mental health (Sakib et al., 2020). Furthermore, fear is a normal response to potentially life-threatening situations, such as pandemics, that promotes coping behaviors before possible threats (Pakpour & Griffiths, 2020); however, when the level of fear is excessive, it can be maladaptive (Asmundson & Taylor, 2020; Mertens et al., 2020). Recent studies have reported that increased fear of COVID-19 was associated with increased levels of depression, anxiety, stress, as well as decreased life satisfaction and resilience (Bitan et al., 2020; Chang et al., 2020; Doshi et al., 2020; Haktanir et al., 2020; Sakib et al., 2020; Satici et al., 2020). In addition, higher levels of fear COVID-19 were found for women, people of low socioeconomic status, individuals with a chronic illness, and among those who have lost a family member due to COVID-19 (Bitan et al., 2020; Broche-Broche-Pérez et al., 2020). In Argentina, a recent study that assessed the feelings and expectations generated by the pandemic indicated the presence of positive feelings such as responsibility, care for COVID-19, and social interdependence, but also feelings of uncertainty, distress, and fear (Johnson et al., 2020).

To assess the fear of COVID-19, the *Fear of COVID-19 Scale* (FCV-19S; Ahorsu et al., 2020) was recently developed. It has been translated into several

CONTACT Tomás Caycho-Rodríguez tomas.caycho@upn.pe Facultad de Ciencias de la Salud, Universidad Privada del Norte, Av. Alfredo Mendiola 6062, Los Olivos, Lima, Perú.

languages and demonstrated adequate psychometric evidence of validity and reliability (Alyami et al., 2020; Bitan et al, 2020; Broche-Pérez et al., 2020; Chang et al., 2020; Haktanir et al., 2020; Huarcaya-Victoria et al., 2020; Martínez-Lorca et al., 2020; Masuyama et al., 2020; Pang et al., 2020; Perz et al., 2020; Reznik et al., 2020; Sakib et al., 2020; Soraci et al., 2020; Tsipropoulou et al., 2020). Most of this research has suggested that this scale has a one-dimensional structure; however, others indicate the presence of two factors: the first related to physiological responses to COVID-19 and the second that represents emotional responses to COVID-19 (Bitan et al., 2020; Huarcaya-Victoria et al., 2020; Masuyama et al., 2020; Reznik et al., 2020).

In addition to the study of the factor structure of the FCV-19S, it is important to evaluate the factor invariance between different groups. However, despite its importance in health sciences (Caycho, 2017), only one study to date has evaluated the factor invariance of FCV-19S among groups of men and women, health and non-health workers, and people under and over 40 years of age, reporting factor invariance only for the latter two groups (Huarcaya-Victoria et al., 2020). The evaluation of factor invariance allows for evidence to make comparisons between groups (Putnick & Bornstein, 2016). The absence of factor invariance suggests that results and interpretations of any group comparisons made might be erroneous and biased toward at least one group (Byrne, 2008).

On the other hand, although the FCV-19S was originally developed using classical test theory and item response theory (Ahorsu et al., 2020), to date only a few subsequent studies have performed this same procedure (Pang et al., 2020; Sakib et al., 2020), but none with the Spanish version. Analyses under classical test theory have the disadvantage of sample dependence, that is, a person's score may be higher if the items are easy or lower if they are difficult, where the difficulty of the items is differentiated according to the ability of the respondents (Embretson & Reise, 2000). Currently, item response theory analysis is widely applied to evaluate the quality of measures used in health sciences, based on obtaining detailed information about factor structure, reliability, and adequacy to use a total score (Leung et al., 2014; Tennant et al., 2004).

Because fear is concentrated in areas with a higher number of diagnosed cases of COVID-19 (Fitzpatrick et al., 2020), as is the case in Argentina, and no measure of fear of COVID-19 is available for this South American country, the objective of this study was to evaluate the psychometric properties of the Spanish version of the FCV-19S in an Argentinean sample. Specifically, we evaluated the evidence of validity based on internal structure, using structural equation models (SEM) and item response theory, reliability, factor invariance across age groups, as well as evidence of validity based on relationships with other variables, such as depression and anxiety.

Method

Participants

A total of 1291 Argentine individuals from the city of Rosario (268 men and 1023 women) aged between 18 and 80 years old ($M = 38.47$, $SD = 15.75$) participated. Participants were selected using a convenience sampling method.

Instruments

Fear of COVID-19

The Fear of COVID-19 Scale (FCV-19S; Ahorsu et al., 2020) is a one-dimensional measure that measures the fear of COVID-19 from seven items (e.g., "My hands get wet when I think about coronavirus-19") with five Likert-type response options, ranging from 1 (strongly disagree) to 5 (strongly agree). Scores for the items are summed, yielding a total score that varies between 7 and 35, with higher scores indicating higher levels of fear of COVID-19. We used the version adapted and validated to Spanish (Huarcaya-Victoria et al., 2020), which provided evidence of validity based on structure, adequate internal consistency, invariance across age groups, as well as evidence of convergent validity with variables such as post-traumatic stress, and depressive and anxious symptoms.

Depressive symptoms

The Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001) has nine items and measures the frequency of nine depressive symptoms in the last two weeks. Each item has four Likert-type response options (0 = not at all, 1 = several days, 2 = more than half the days, and 3 = almost every day). We used the recently validated version for the Argentinean population (Urtasun et al., 2019), which has a high internal consistency and evidence of convergent validity with the BDI-II scale. The sum of the responses to each item yields a total score ranging from 0 to 27, where high scores indicate a greater frequency of depressive symptoms. Scores from 6 to 8 indicate mild

depression, 9 to 14 moderate depression and 15 or more points indicate severe depression.

Generalized anxiety symptoms

The *Generalized Anxiety Disorder Questionnaire* (GAD-7; Spitzer et al., 2006) is self-report measure comprising seven items that evaluate the frequency of symptoms of generalized anxiety disorder. We used the Spanish version (García-Campayo et al., 2010). The items have four 4-point Likert-type response options (0 = not at all, 1 = several days, 2 = more than half of the days, and 3 = almost every day). Total scores range from 0 to 21, with higher scores indicating a higher frequency of GAD symptoms.

Procedure

The study was carried out between June and July 2020, which corresponded to the initial phase of the COVID-19 pandemic in Argentina. The study questionnaire, which was developed with the digital platform Google Forms, included a sociodemographic section as well as the measures PHQ-9, GAD-7, and FCV-19S. A link to the study questionnaire was distributed on Facebook, Twitter, Instagram, and by email. Before responding to the questionnaire, we disclosed the objectives of the study, the procedures involved in it, and the expected time commitment. We required the completion of informed consent and provided contact information to reach the study coordinator for any questions or recommendations about available mental health services. We guaranteed the confidentiality of the information collected and assured participants that they could withdraw at any point. People under 21 years of age were excluded from the study. The study followed the ethical guidelines of the American Psychological Association (APA, 2010) and it was supported by the Neuroscience Research Center of Rosario (CINR) and the Cognition and Emotion Lab (LABce), both belonging to the Faculty of Psychology of the National University of Rosario (UNR).

Data Analysis

Using SPSS 22.0 for Windows, we calculated descriptive statistics. Then, we performed two Confirmatory Factor Analyses (CFA) to evaluate the internal structure of the FCV-19S and its relationships with other variables at the latent level. In both cases, the Diagonally Weighted Least Squares with Mean and Variance corrected (WLSMV) estimator was used due to the ordinal nature of the items (Brown, 2015). The chi-square test (χ^2), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residuals (SRMR) were used to evaluate model fit, in which case values less than .05 indicated good fit, and between .05 and .08 were considered acceptable (Kline, 2015). In addition, the Confirmatory Fit Index (CFI) and Tucker-Lewis index (TLI) were used, where values greater than .95 indicated a good fit and greater than .90 an acceptable fit (Schumacker & Lomax, 2015). Factorial loads (λ) greater than .50 were considered adequate (Dominguez-Lara, 2018). To evaluate internal consistency, the omega coefficient was used (McDonald, 1999), where a value of $\omega > .80$ is adequate (Raykov & Hancock, 2005).

To evaluate the factor invariance of the scales according to the age of the participants, a sequence of hierarchical variance models, increasingly restrictive, was used. First, the configural invariance (reference model) was evaluated, followed by the metric invariance (equality of factor loads), the scalar invariance (equality of factor loads and intercepts), and finally, the strict invariance was tested (equality of factor loads, intercepts and residuals). To compare the sequence of models, first a formal statistical test was used, for which the Chi-square difference ($\Delta\chi^2$) was used, where non-significant values ($p > .05$) suggested invariance between the groups. Secondly, a modeling strategy was employed, using the differences in the CFI (ΔCFI) where values less than <.010 provided evidence model invariance between groups (Chen, 2007). The RMSEA (ΔRMSEA) was also used, where differences of less than <.015 showed the invariance of the model among the groups (Chen, 2007).

For item response theory-based analyses, a Graduated Response Model (Samejima, 1997) was used, specifically an extension of the 2-Parameter Logistic Model for ordered polytomous items (Hambleton et al., 2010). For each item, two types of parameters were estimated: discrimination and difficulty. The discrimination parameter determines the slope at which the responses to the items change as a function of the level in the latent trait, whereas the difficulty parameters of item determine how much of the latent trait the item requires to be answered. Since scales have five response categories, there are four difficulty estimates, one per threshold. The estimates for these four thresholds indicate the level of the latent variable at which an individual has a 50% chance of obtaining a score equal to or greater than a particular response category. The Information Curves for the

Table 1. Descriptive analysis of the items and polychoric correlation matrix.

	Total sample ($N = 1291$)				*Polychoric correlation matrix*						
Items	M	SD	g^1	g^2	M1	M2	M3	M4	M5	M6	M7
M1	2.58	1.29	.32	−1.00	1	.51	.51	.66	.58	.56	.58
M2	2.68	1.38	.26	−1.19		1	.39	.40	.51	.41	.42
M3	1.31	.77	2.91	8.72			1	.55	.52	.64	.64
M4	1.73	1.15	1.56	1.44				1	.54	.59	.63
M5	2.20	1.31	.76	−.66					1	.62	.65
M6	1.32	.78	2.76	7.62						1	.76
M7	1.52	1.00	2.05	3.38							1

Note: M = Mean; SD = Standard deviation; g^1 = Asymmetry; g^2 = Kurtosis.

Table 2. Two-factor related model fit indices and age invariance models.

Models	χ^2	df	p	SRMR	TLI	CFI	RMSEA	$\Delta\chi^2$	Δdf	p	ΔCFI	ΔRMSEA
Total sample												
Unididimensional model	143.55	14	<.001	.039	.96	.97	.085	–	–	–	–	–
Two-factor related model	88.71	13	<.001	.029	.97	.98	.067	–	–	–	–	–
By age group												
Early adulthood (18 − 40 years old)	77.14	13	<.001	.036	.97	.98	.078	–	–	–	–	–
Middle adulthood (41 − 65 years old)	32.25	13	.002	.029	.98	.99	.063	–	–	–	–	–
Late adulthood (66 − 80 years old)	16.51	13	.223	.050	.98	.99	.052	–	–	–	–	–
Configural	121.28	39	<.001	.039	.98	.98	.070	–	–	–	–	–
Metric	185.49	49	<.001	.041	.97	.98	.081	27.00	10	.002	−.008	.010
Scalar	268.31	87	<.001	.050	.98	.97	.070	60.80	38	.010	−.007	−.011
Strict	306.77	91	<.001	.051	.97	.96	.074	13.08	4	.010	−.005	.005

Note: 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; $\Delta\chi^2$ = Chi square change; Δdf = degrees of freedom change; ΔRMSEA = Root Mean Square Error of Approximation change; ΔCFI = Comparative Fix Index change.

items and the test (Item Information Curves and Test Information Curves) were also calculated.

The statistical analyses were performed with the "lavaan" package (Rosseel, 2012) for the CFA, the "semTools" package (Jorgensen et al., 2018) for factor invariance, and the "ltm" package for Graduated Response Models (Rizopoulos, 2006). In all cases, the RStudio environment (RStudio Team, 2018) was used for R (R Core Team, 2019).

Results

Descriptive analyses

Mean ages of male ($M = 39.36$, $SD = 15.74$) and female ($M = 38.24$, $SD = 15.75$) participants did not differ significantly ($t = -1.033$, $p = .302$, $d = .07$ [95% CI: −.06, .21]). Using their reported age, participants were classified into three groups: early adulthood (18–40 years; $N = 814$), middle adulthood (41–65 years; $N = 377$), and late adulthood (66–80 years; $N = 100$) as proposed by Papalia et al. (2012).

Table 1 indicates that item 2 ("I am uncomfortable thinking about the COVID-19") had the highest average score in the sample ($M = 2.68$); while item 3 ("My palms get clammy when I think of COVID-19") had the lowest average score ($M = 1.3$). In addition, in the polychoric correlation matrix all items had moderate to high correlations. Regarding the indices of asymmetry and kurtosis, items 3, 6 and 7 did not present adequate indices (> ± 1.5) in the sample.

Validity based on internal structure and reliability

Table 2 shows that the two-factor related model has adequate fit indices for the total sample of participants ($\chi^2 = 88.71$; $p < .001$; CFI = .98; TLI = .97; RMSEA = .067; SRMR = .029). However, since the two dimensions presented a high level of correlation ($r = .89$), a one-dimensional model was evaluated, but this had lower fit indices than the previous model ($\chi^2 = 143.55$; $p < .001$; CFI = .97; TLI = .96; RMSEA = .085; SRMR = .039). Based on these results, the two-factor related model was used as a reference to evaluate the internal structure between the different age groups and the factor invariance of the FCV-19S. A CFA was performed separately for each age group. Fit indices are shown in Table 2.

In general, results showed that the two-factor related model had adequate fit indices for the early adult ($\chi^2 = 77.14$; $p < .001$; CFI = .98; TLI = .97; RMSEA = .078; SRMR = .036), intermediate adulthood ($\chi^2 = 33.25$; $p = .002$; CFI = .99; TLI = .98; RMSEA = .063; SRMR = .029) and late adulthood groups ($\chi^2 = 16.51$; $p = .223$; IFC = .99; TLI = .98;

Table 3. Standardized factor loadings of the items and reliability of the scale according to age and total sample.

	Total sample ($N = 1291$)		Early adulthood ($n = 814$)		Middle adulthood ($n = 377$)		Late adulthood ($n = 100$)	
Items	Factor 1 λ (error)	Factor 2 λ (error)	Factor 1 λ (error)	Factor 2 λ (error)	Factor 1 λ (error)	Factor 2 λ (error)	Factor 1 λ (error)	Factor 2 λ (error)
3	.75 (.44)		.82 (.33)		.62 (.62)		.67 (.55)	
6	.85 (.28)		.88 (.23)		.82 (.33)		.76 (.43)	
7	.88 (.22)		.86 (.27)		.96 (.07)		.79 (.38)	
1		.79 (.38)		.79 (.38)		.82 (.33)		.74 (.46)
2		.60 (.64)		.65 (.57)		.56 (.69)		.22 (.95)
4		.78 (.39)		.73 (.46)		.87 (.24)		.86 (.25)
5		.78 (.40)		.78 (.39)		.78 (.39)		.85 (.27)
Reliability								
ω	.80	.73	.83	.73	.74	.77	.70	.67

Note: λ= factor loadings; Factor 1 = Physiological dimension; Factor 2 = Emotional dimension.

RMSEA = .052; SRMR = .050). All standardized factor loads (λ) of the latent variable were statistically significant ($p < .001$) and ranged from .65 to .88 for the early adult sample, .56 to .87 for the intermediate adult sample, and .22 to .86 for the late adult sample (Table 3). Only item 2 had a low λ in the older adult group ($\lambda = .22$).

Regarding the model's reliability (Table 3), the physiological ($\omega = .80$) and affective ($\omega = .73$) dimensions had adequate reliability indexes. Similar results were obtained across all three age groups: early adulthood ($\omega = .83$ and $\omega = .73$), intermediate adulthood ($\omega = .74$ and $\omega = .77$), and late adulthood ($\omega = .70$ and $\omega = .67$).

Factorial invariance by age

The goodness of foot indices for factor invariance testing of the two-factor model across the different age groups and the variations in the CFI and RMSEA indices between the models are presented in Table 2. The factor structure of the scale has shown evidence of being strictly invariant for the early, intermediate, and late adult groups in the sequence of invariance models proposed: metric invariance (ΔCFI = −.008; ΔRMSEA = .010), scalar (ΔCFI = −.007; ΔRMSEA = −.011), and strict (ΔCFI = −.005; ΔRMSEA = .005).

Item response theory model: graduated response model

Two Graduated Response Models were adjusted, specifically a 2-Parameter Logistic Model for each dimension of the scale. Table 4 shows that all parameters of discrimination of the items of the physiological and emotional dimensions are above the value of 1. Regarding the parameters of difficulty, in both dimensions, all the estimators of the thresholds increased monotonically, as expected.

Table 4. Discrimination and difficulty parameters for the items in each dimension.

Dimensions	Item	a	b_1	b_2	b_3	b_4
Physiological	M3	1.98	1.19	1.86	2.51	2.93
	M6	3.26	1.01	1.55	2.05	2.57
	M7	2.99	.71	1.28	1.69	2.22
Emotional	M1	2.78	−.69	.01	.76	1.54
	M2	1.42	−.89	.00	.80	1.75
	M4	2.08	.39	1.06	1.61	2.13
	M5	1.82	-.24	.51	1.14	1.97

Note: a = Discrimination parameters; b = Difficulty parameters.

Figure 1 shows the Item Information Curves and Test Information Curves for each factor. Regarding the physiological dimension, the Item Information Curve shows that items 6 and 7 are the most accurate to evaluate the latent trait. In addition, the Test Information Curve indicates that the factor is more reliable (precise) in the range of the scale between 0.5 and 3. With respect to the emotional dimension, the Item Information Curve shows that items 1 and 4 are the most precise to evaluate the latent trait. In addition, the Item Information Curve shows that the factor is more reliable (accurate) in the range of the scale between −1 and 2.5.

Validity based on the relationship to other constructs

Considering a literature review, we proposed a model to evaluate the relationship between fear of COVID-19, anxiety, and depression. Table 5 shows that the structural model presents adequate fit indices ($\chi^2 = 1544.95$; $p < .001$; RMSEA = .068; CFI = .95; TLI = .94) and the measurement models are adequately represented by their items (see Figure 2).

Discussion

To date, little attention has been given to assessing the psychometric properties of instruments designed

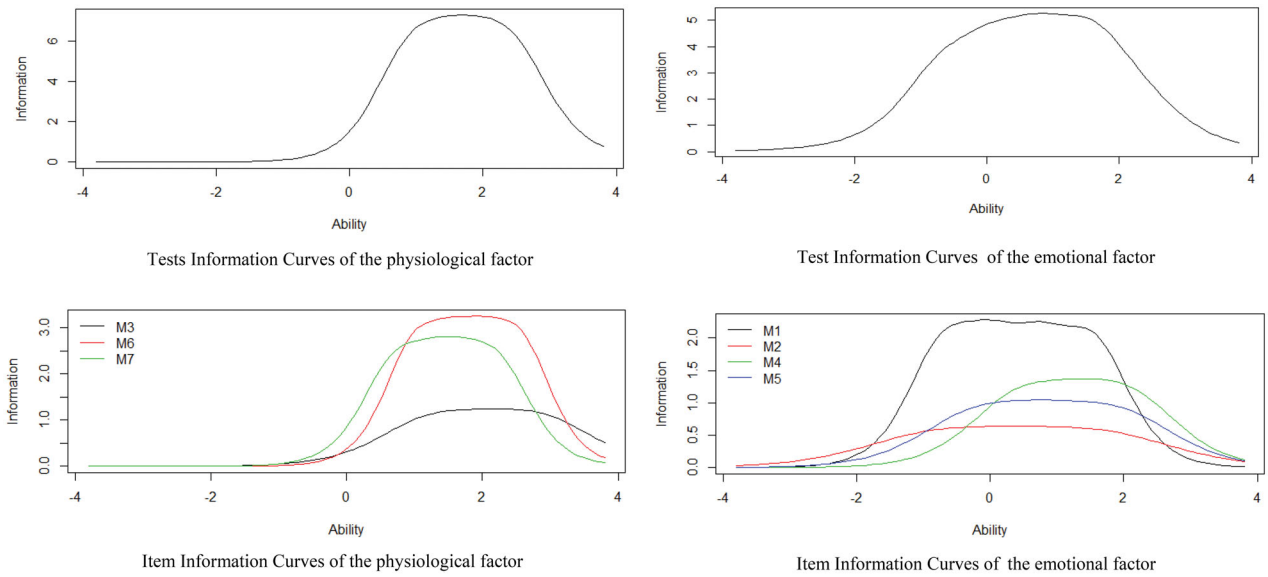

Figure 1. Item and test information curves for the scale.

Table 5. Relationship of Fear of COVID-19 with other variables.

Structural model							
χ^2	df	*p*	RMSEA	CI 90%	SRMR	CFI	TLI
1544.95	224	<.001	.068	.064–.071	.064	.95	.94

Measurement models				
Fear of COVID-19			Anxiety	Depression
λ (item)		λ (item)	λ (item)	λ (item)
	.74 (.M3)		.82 (A1)	.76
	.85 (M6)		.58 (A2)	.89
	.89 (.M7)		.80 (A3)	.76
		.76 (.M1)	.84 (A4)	.79
		.62 (M2)	.69 (A5)	.67
		.75 (M4)	.76 (A6)	.80
		.82 (M5)	.69 (A7)	.70
				.72
				.65

Note: λ: Factor loading.

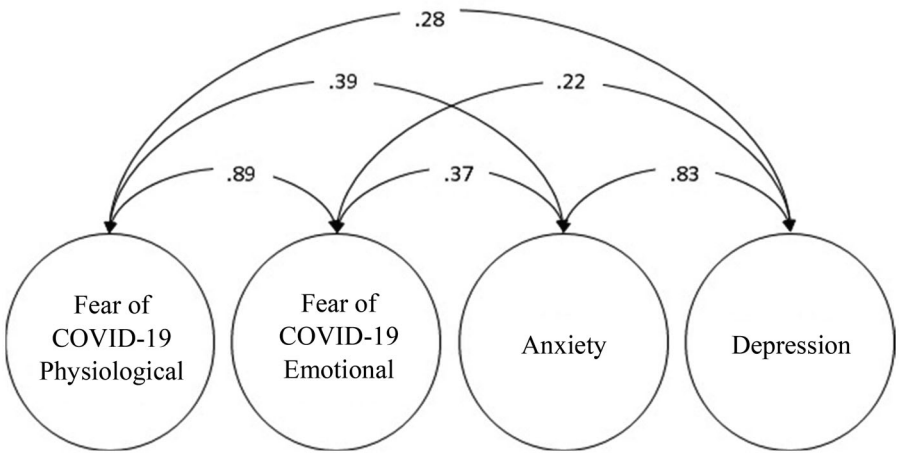

Figure 2. Relationship model with other constructs.

to measure mental health symptoms during the COVID-19 pandemic, particularly in Spanish-speaking Latin American countries such as Argentina. In this respect, this brief study provides the first empirical evidence of validity, reliability, and factor invariance among different age groups of the FCV-19S, using classical test theory and modern (i.e., item response theory) techniques.

The results of this study coincide with international research on the factor structure of the FCV-19S (Bitan et al., 2020; Huarcaya-Victoria et al., 2020; Masuyama et al., 2020; Reznik et al., 2020). That is, the emotional and physiological dimensions of fear are satisfactorily explained from a model of two related factors. This supports the idea that the fear of COVID-19 is a multidimensional construct (Huarcaya-Victoria et al., 2020), which allows differentiating between fear and its symptoms (Bitan et al., 2020). However, the finding is not consistent with previous studies where they reported that the single-factor model provided the best fit (Ahorsu et al., 2020; Alyami et al., 2020; Sakib et al., 2020; Soraci et al., 2020; Satici et al., 2020).

On the other hand, in the total sample, the factor loads of the items corresponding to the emotional dimension had lower average values than those of the physiological dimension. In that sense, it seems that the sample of participants would experience more physiological symptoms associated with fear of COVID-19 such as the presence of clammy palms, sleep disturbances, and heart palpitations. This is different from those reported by previous studies (Alyami et al., 2020; Masuyama et al., 2020; Reznik et al., 2020). It is also important to evaluate item 2 ("I am uncomfortable thinking about COVID-19") which had a low factorial load and does not seem to be a representative item in the older adult group. The importance of this is increased if we consider that fear in older adults during the COVID-19 pandemic decreases their resilience and negatively affects their health and well-being (Montero-Odasso et al., 2020; Plagg et al., 2020).

Regarding the results of the Graduated Response Model, the items of the physiological and emotional dimension presented good discrimination, which indicated the facility to answer questions directly associated with the emotional and physiological symptoms of the fear by the COVID-19. Likewise, values of the difficulty parameters indicated that a greater presence of the latent trait (in this case, fear of the COVID-19) is required to answer the higher response categories (Hambleton et al., 2010). The IICs showed that the items are different in their ability to discriminate, which suggests that assigning equal weights to the items may be counterproductive.

In addition, the reliability analysis, based on McDonald's (1999) omega coefficient, indicated a high internal consistency of both factors. Also, factor invariance was demonstrated among different age groups, which indicated the ability to assess COVID-19 fear in a similar way and with the same accuracy in the Argentinean general population of different ages. This also suggests that fear of COVID-19, as measured by the FCV-19S, has the same meaning in the different age groups evaluated. Therefore, despite the fact that younger age groups show slightly higher levels of fear compared to older ones (Doshi et al., 2020), age does not seem to affect the pattern of fear response, allowing interpretation that possible differences in fear levels between groups are true and not biased assessments in favor of any one group. This result is similar to that reported in the Peruvian population where the FCV-19S is invariant between people under and over 40 years of age (Huarcaya-Victoria et al., 2020).

Evidence of validity based on relationships with other variables showed positive and significant correlations between fear of COVID-19, depression, and anxiety. Other studies also suggest that fear of COVID-19 has positive associations with anxiety and depression (Ahorsu et al., 2020; Bitan et al., 2020; Chang et al., 2020; Doshi et al., 2020; Haktanir et al., 2020; Sakib et al., 2020). Specifically, a differential pattern was also observed in these associations, where the physiological dimension showed higher correlations with anxiety and depression, coinciding with a previous study in Israel (Bitan et al., 2020). These results are to be expected, since the high rate of infection, the greater negative consequences compared to other viral respiratory diseases, and the frequent exposure to information on deaths around the world, lead individuals to experience higher levels of fear, depression, and anxiety (Bakioğlu et al., 2020).

Overall, the findings show that the FCV-19S provides valid and reliable scores for measuring fear of COVID-19 in the general population of Argentines in different age groups. Therefore, it is suitable for use in large-scale epidemiological studies, studies that evaluate the effectiveness of psychological interventions, and for identifying the presence of fear of COVID-19 in the population of Argentina (Pang et al., 2020).

The main strengths of the study are the large sample size, a wide age range among participants, and the combination of statistical procedures derived from classical test theory and item response theory. However, it is important to consider some limitations. First, a convenience sample was used that does not adequately represent the general population of Argentina. Therefore, it is necessary to have a more representative and diverse sample to compare and generalize the results. Second, self-report measures were used to assess fear of COVID-19, anxiety, and

depression. This technique can be influenced by social desirability, memory, and other biases, so it is recommended to use other information gathering techniques such as in-depth interviews. Third, the study had a cross-sectional design which prevents providing information about causality among the variables fear of COVID-19, anxiety, and depression. Future studies should have a longitudinal design to evaluate the causal relationships between the variables mentioned above. Fourth, the stability of the FCV-19S scores over time was not examined. Test-retest reliability measures should be incorporated in the future. Fifth, the absence of the factor invariance assessment by sex was due to the unequal number of men and women, where the majority were women. It is suggested that for factor invariance analysis it is necessary that the number of participants in each group be similar to identify invariances (Bollen, 1989).

Despite these limitations, the results of the study showed that the Spanish version of the FCV-19S has solid psychometric properties, based on classic and modern statistical techniques, to be used in measuring fear of COVID-19 during the pandemic in the general population of Argentina. As far as we know, this is the first study that evaluates the psychometric properties of the FCV-19S in Argentina. Therefore, the findings are expected to fill the instrumental gap for measuring and researching COVID-19 fear in this country (Pang et al., 2020). Finally, having a validated version for the Argentinean context complements the versions available in other cultural contexts and facilitates global comparative studies of COVID-19 mental health in times of pandemic.

ORCID

Tomás Caycho-Rodríguez http://orcid.org/0000-0002-5349-7570
Lindsey W. Vilca http://orcid.org/0000-0002-8537-9149
Mauricio Cervigni http://orcid.org/0000-0002-9951-1737
Miguel Gallegos http://orcid.org/0000-0001-6891-7833
Pablo Martino http://orcid.org/0000-0002-5633-2050
Nelson Portillo http://orcid.org/0000-0001-7628-2786
Ignacio Barés http://orcid.org/0000-0002-8776-1691
Manuel Calandra http://orcid.org/0000-0003-1349-484X
Carmen Burgos Videla http://orcid.org/0000-0003-2718-8579

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