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The Fear of COVID-19 Scale: Its Structure and Measurement Invariance Across 48 Countries

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Coronavirus disease (COVID-19) has been a source of fear around the world. We asked whether the measurement of this fear is trustworthy and comparable across countries. In particular, we explored the measurement invariance and cross-cultural replicability of the widely used Fear of COVID-19 scale (FCV-19S), testing community samples from 48 countries (N = 14,558). The findings indicate that the FCV-19S has a somewhat problematic structure, yet the one-factor solution is replicable across cultural contexts and could be used in studies that compare people who vary on gender and educational level. The validity of the scale is supported by a consistent pattern of positive correlations with perceived stress and general anxiety. However, given the unclear structure of the FCV-19S, we recommend using latent factor scores, instead of raw scores, especially in cross-cultural comparisons.

Public Significance Statement
The study suggests that the widely used Fear of COVID-19 scale (FCV-19S) could be used in cross-cultural research. However, given the scale's unclear structure, we recommend implementing the latent factor approach instead of relying on raw scores.

Keywords: fear of COVID, measurement invariance, cross-cultural studies, coronavirus

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Confirmed cases and deaths linked to the Coronavirus disease (COVID-19) pandemic continue to occur daily worldwide (World Health Organization, 2021). The pandemic has also afflicted the public health systems and global economy. More relevant to this article, the pandemic has impacted mental health (Pfefferbaum & North, 2020; Torales et al., 2020), including increases in psychological distress (Xiong et al., 2020), loneliness (Zhou et al., 2021), depression, and anxiety (Fofana et al., 2020). The pandemic remains a source of unpredictability and threat (Counted et al., 2020; Fofana et al., 2020; Govender et al., 2020) that are likely to culminate in fear (Lazarus, 2006). Critically, the pandemic constitutes a direct source of fear (Enea et al., 2021; Fitzpatrick et al., 2020; Fofana et al., 2020), which negatively influences functioning in occupational (Fu et al., 2021; Hu et al., 2020) and family (Trougakos et al., 2020)

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life domains. As such, a measure of fear of COVID-19 can facilitate both basic and interventional research. We aimed to evaluate the psychometric properties of the most popular relevant instrument, the Fear of COVID-19 Scale (FCV-19S; Ahorsu et al., 2020). The pertinent article has been cited over 1,700 times (Google Scholar; November 2, 2021). We assessed the FCV-19S's measurement invariance across 48 countries and tested its validity by examining its relations with gender, educational level, anxiety, and stress. The cross-cultural applicability of the scale has both empirical and practical implications. The scale is useful in identifying predictors and consequences of fear of COVID-19 globally and in shaping national and international policies to prevent the deleterious psychological effects of the pandemic.

Measuring Fear of COVID-19 Around the World

The FCV-19S (Ahorsu et al., 2020) was developed in response to the need to investigate the implications of the pandemic for physical and mental health. The item pool was chosen from 30 scales measuring fear (e.g., of dental examinations, chronic pain, or cancer) in diverse samples. This pool was then reduced by a panel of experts and researchers. The pool was further reduced based on psychometric analyses, resulting in a 7-item scale. We list these items in the original order (Ahorsu et al.), and we refer to them in the same order in our article: (1) "I am most afraid of coronavirus-19," (2) "It makes me uncomfortable to think about coronavirus-19," (3) "My hands become clammy when I think about coronavirus-19," (4) "I am afraid of losing my life because of coronavirus-19, (5) "When watching news and stories about coronavirus-19 on social media, I become nervous or anxious," (6) "I cannot sleep because I'm worrying about getting coronavirus-19," (7) "My heart races or palpitates when I think about getting coronavirus-19". The FCV-19S, developed in Iranian samples, has a unifactorial structure with good internal consistency and validity, as demonstrated by its positive relationships with anxiety, depression, perceived infectability, and germ aversion (Ahorsu et al.).

The scale has been used widely across cultures. In relation to its psychometric properties, the FCV-19S has been validated chiefly through exploratory factor analyses (EFA) and confirmatory factor analyses (CFA). Most of these analyses produced a one-factor solution, although some yielded correlations of error variances between particular items (Alyami et al., 2020; Cavalheiro & Sticca, 2020; Mailliez et al., 2021; Wakashima et al., 2020). The rest of the analyses, though, produced a two-factor solution, with one factor reflecting psychological (items 1, 2, 4, 5) and another physiological (items 3, 6, 7) aspects of fear of COVID-19 (Barrios et al., 2021; Bitan et al., 2020; Iversen et al., 2021; Midorikawa et al., 2021; Reznik et al., 2020). Further, analyses in a few countries (i.e., Iran, Japan, Peru) suggested a modified adoption of the bifactor model involving a general factor and two specific factors (i.e., physiological and psychological; Caycho-Rodríguez, Tomás, et al., 2021; Huarcaya-Victoria et al., 2020; Masuyama et al., 2020).

In summary, the factorial structure of FCV-19S is unclear. Although most analyses pointed to a unifactorial solution, other analyses indicated that the corresponding model fitted the data poorly, requiring additional modifications such as correlating the error variances of the

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Data, study materials, and all analyses codes are available at https://osf.io/hxmzb.

The study was a part of a preregistered project, which details are available at https://osf.io/hpwbj.

Artur J. Sawicki played lead role in conceptualization, data curation, formal analysis, visualization, writing of original draft and writing of review and editing and supporting role in methodology. Magdalena Żemojtel-Piotrowska played lead role in conceptualization, methodology, project administration, writing of original draft and writing of review and editing and equal role in funding acquisition and supervision. Julia M. Balcerowska played supporting role in conceptualization and writing of review and editing and equal role in writing of original draft. Monika J. Sawicka played equal role in writing of original draft. Jarosław Piotrowski played lead role in methodology and project administration. Constantine Sedikides played lead role in supervision and writing of original draft and supporting role in writing of review and editing. Peter K. Jonason played supporting role in writing of review and editing. John Maltby played equal role in investigation. Mladen Adamovic played equal role in investigation. Attisso Mathieu Désiré Agada played equal role in investigation. Oli Ahmed played supporting role in writing of review and editing and equal role in investigation. Laith Al-Shawaf played supporting role in writing of review and editing and equal role in investigation. Seth Christopher Yaw Appiah played equal role in investigation. Rahkman Ardi played equal role in investigation. Zana Hasan Babakr played equal role in investigation. Sergiu Bălţătescu played equal role in investigation. Mario Bonato played equal role in investigation. Richard G. Cowden played supporting role in funding acquisition and writing of review and editing and equal role in investigation. Phatthanakit Chobthamkit played equal role in investigation. Laura De Pretto played equal role in investigation. Valdiney V. Gouveia played equal role in investigation. Carmen Haretche played equal role in investigation. Dzintra Iliško played equal role in investigation. John Jamir Benzon Aruta played equal role in investigation. Fanli Jia played supporting role in writing of review and editing and equal role in investigation. Veljko Jovanović played supporting role in writing of review and editing and equal role in investigation. Tomislav Jukić played equal role in investigation. Shanmukh V. Kamble played equal role in investigation. Narine Khachatryan played equal role in investigation. Martina Klicperova-Baker played equal role in investigation. Metodi Koralov played equal role in investigation. Monika Kovacs played equal role in investigation. Mabelle Kretchner played equal role in investigation. Aitor Larzabal Fernandez played equal role in investigation. Kadi Liik played equal role in investigation. Najma Iqbal Malik played equal role in investigation. Karine Malysheva played equal role in investigation. Chanki Moon played supporting role in funding acquisition and equal role in investigation. Stephan Muehlbacher played equal role in investigation. Sofya Nartova-Bochaver played equal role in investigation. Jorge Torres-Marin played equal role in investigation. Emrah Özsoy played equal role in investigation. Joonha Park played equal role in investigation. Elena Piccinelli played supporting role in writing of review and editing and equal role in investigation. Jano Ramos-Diaz played equal role in investigation. Ognjen Riđić played equal role in investigation. Adil Samekin played equal role in investigation. Andrej Starc played equal role in investigation. Trà T. T. Kiêu played equal role in investigation. Robert Tomsik played equal role in investigation. Charles S. Umeh played equal role in investigation. Eduardo Wills-Herrera played equal role in investigation. Anna Wlodarczyk played equal role in investigation. Zahir Vally played equal role in investigation. Somayeh Zand played equal role in investigation.

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items or proposing two independent factors. Therefore, the validity of the FCV-19S across cultures is yet to be established.

Measurement Invariance

Given the popularity of the FCV-19S in many countries, we zeroed in on the comparability of results across cultural contexts both in terms of level of fear of COVID-19 and the scale's predictors, correlates, and consequences. Measurement invariance allows a researcher to examine the extent to which scale-relevant results obtained in different cultures or groups (e.g., gender, educational level, religious denomination) are due to actual differences between cultures or groups (Cieciuch et al., 2019; Milfont & Fischer, 2010). Three levels of measurement invariance are typically assessed in cross-cultural studies: configural, metric, and scalar. Configural measurement invariance informs whether the scale factor structure (i.e., number of factors) is the same across compared groups. Metric invariance informs whether factor loadings are similar across groups, and allows for comparisons of correlates and regression weights across groups. Scalar measurement invariance informs whether the residuals are equivalent across compared groups, permitting comparisons of the latent factor scores. Multigroup confirmatory factor analysis provides evidence of whether parameters in the model are equal. Thus, the measurement invariance approach might be considered demanding, especially if a large number of groups is analyzed and scalar invariance is needed to test the hypotheses (Cieciuch et al., 2019). The alignment procedure, based on the Bayesian framework, addresses this problem (Muthén & Asparouhov, 2013). The procedure tests approximate measurement invariance, which extracts means as trustworthy as possible (and to some extent invariant), letting researchers to compare group levels of the studied phenomena.

Measurement invariance, albeit crucial for reliable comparisons between groups, has been underinvestigated in the context of the FCV-19S. We were able to locate only a handful of studies examining the measurement invariance of the FCV-19S. One study on the scale's cross-cultural measurement invariance among Latin American countries found that the general population in Argentina, Colombia, Ecuador, El Salvador, Mexico, Paraguay, and Uruguay conceptualizes fear of COVID-19 in a bi-factorial structure (Caycho-Rodríguez, Valencia, et al., 2021). However, this study identified only partial scalar invariance, indicating that one item [(4) "I am afraid of losing my life because of coronavirus-19"] is not invariant. One cross-cultural study did not report the scale's factorial structure and psychometric properties (Ali et al., 2021), and another illustrated invariance between the Dominican Republic and Spain (Piqueras et al., 2021). Lastly, a recent study (Lin et al., 2021) across 11 countries (i.e., Bangladesh, Brazil, Cuba, France, Iran, Italy, Japan, New Zealand, Pakistan, Taiwan, United Kingdom), primarily based on datasets from previous studies on the psychometric properties of the FCV-19S, showed that a one-factor solution of the FCV-19S indicated partial scalar invariance across countries and scalar invariance across gender and age groups (i.e., child, young to middle-aged adult, older people). Other studies also demonstrated invariance between genders (Piqueras et al., 2021; Sakib et al., 2020) and healthcare workers versus nonhealthcare workers (Huarcaya-Victoria et al., 2020). Further, two studies showed invariance between age groups (younger vs. older, with the specific age threshold varying across studies; Huarcaya-Victoria et al., 2020; Piqueras et al., 2021; Sakib et al., 2020). Taken together, although former studies have been concerned with FCV-19S's equivalency across a limited number of cultures (and some groups), no study has examined the scale's equivalency globally via a standardized procedure of data collection in culturally diversified context (i.e., most world regions).

Validity Criteria

Given the enormous popularity of the FCV-19S, some evidence has been accumulated pertaining to the relationship between fear of COVID-19 and demographic variables, like gender and education, and the relationship between fear of COVID-19 and general anxiety or stress. Fear of COVID-19 is higher among women (Ahmed et al., 2020; Gao et al., 2020; Lei et al., 2020), with a meta-analysis indicating that women are generally more responsive to negative emotional stimuli (Stevens & Hamann, 2012). Also, fear of COVID-19 is higher among individuals with lower education (Gao et al., 2020; Mazza et al., 2020; Olagoke et al., 2020; Wang et al., 2020), as these individuals have reduced access to health care (Oliver & Mossialos, 2004) and are thus more likely to suffer severe consequences of COVID-19 (i.e., hospitalization; Niedzwiedz et al., 2020). Fear is an adaptive response to threat (Ramikie & Ressler, 2018), usually followed by avoidance. If the threat is difficult to avoid, as is the case with the pandemic, it may cascade into general anxiety and stress (Gross & Jazaieri, 2014). Indeed, the literature points to positive relationships between fear of COVID-19 on the one hand, and general anxiety as well as stress on the other (Ahorsu et al., 2020; Bitan et al., 2020; Mertens et al., 2021; Satici et al., 2020; Tsipropoulou et al., 2020). It is important, though, to examine the magnitude of overlap between measures of the FCV-19S and anxiety, as well as measures of the FCV-19S and stress. High correlations would indicate a considerable overlap between measured constructs (Vatcheva et al., 2016). As such, we considered both anxiety and stress as external criteria of fear of COVID-19.

Present Study

We examined the factorial structure and measurement invariance of the FCV-19S across 48 cultures, and across gender and education. To this end, we analyzed data originating from a single project, with a standardized way of data collection, using identical online surveys across all countries. We expected to find metric levels of measurement invariance, allowing for a reliable comparison of the scale's predictors and correlates. We also examined the scale's validity, expecting higher levels of fear of COVID-19 among women and less educated individuals, and moderate positive correlations with anxiety and stress. We measured anxiety and stress with well-established and widely used—including cross-culturally—scales (Leung et al., 2010; Marteau & Bekker, 1992; Vallejo et al., 2018). These were the State-Trait Anxiety Inventory 6 (STAI-6; Tluczek et al., 2009) and the Perceived Stress Scale 4 (PSS-4; Cohen et al., 1983).

Method

Participants

We collected the data online between 24th April and 20th November 2020 as a part of the international project "COVID-19, Personality and Quality of Life: Self-Enhancement in the Time of Pandemic," spanning 60 countries.[1] Participants were invited to

[1] See: https://osf.io/hpwbj (preregistered OSF project).

engage in the study via email or an announcement on Facebook forums devoted to COVID-related topics, which included a link to the project's website. There, participants reported their nationality and country of residence, and selected their preferred language version out of 35 languages.[2] We did not offer remuneration, except for the Republic of South Africa and the United Kingdom (2GBP, or approximately 2.5USD, per participant in each case).[3] We set a minimum $N = 100$ for each country (Supplemental Material, Table S7). Samples from 48 countries reached that threshold (Table 1). We included only participants over the age of 18 years who answered all measures.[4] The sample comprised 14,558 participants (65.64% women, 33.76% men, 0.60% "other" or unreported), aged between 18 and 98 years ($M = 31.70$, $SD = 12.34$). Of participants, 1.15% had a Primary Education degree, 4.32% a Lower Secondary Education degree, 28.75% an Upper Secondary Education degree, (37.52%) a Bachelor's (or equivalent) degree, 22.94% a Master's [or equivalent] degree, and 5.33% a PhD degree. Lastly, participants' responses to a socioeconomic status; SES question ("How would you describe the economic status of your family on a scale from 1 to 7?"; 1 = *much lower than average*, 4 = *average*, 7 = *much higher than average*) hovered around the scale mean ($M = 4.26$, $SD = 1.67$).

Procedure and Measures

Scales were presented in a separate random order for each participant. Where a translation to a local language was unavailable, local team members translated it using a back-translation procedure (Brislin, 1970). In the present study, we only analyzed the data about fear of COVID-19, anxiety, and stress. Fear of COVID-19 was measured with the FCV-19S (1 = *strongly disagree*, 7 = *strongly agree*). Anxiety was measured with the 6-item STAI-6 (Tluczek et al., 2009). Participants indicated how frequently (0 = *never*, 4 = *very often*) in the last month they experienced each anxiety-relevant state (e.g., "I felt tense," "I felt worried"). Stress was measured with the 4-item PSS-4 (Cohen et al., 1983). Participants indicated how frequently (0 = *never*, 4 = *very often*) in the last month they experienced each relevant state [e.g., " . . . unable to control the important things in your life?," " . . . felt that things were going your way?" (reverse-scored)]. We report descriptive statistics and estimates of internal consistency for all scales in Table 2. The project was reviewed and approved by the Ethics Committee of Cardinal Stefan Wyszyński University in Warsaw.

Data-Analytic Strategy

We began by conducting a CFA of the FCV-19S across all (48) studied countries. We tested several factor structure variations of the FCV-19S, with a single-factor structure as the starting point. We followed up with exploratory testing of the two-factor model and the modified single-factor model in which we estimated freely (6) error covariances. In the CFA, where country-level samples had a poor fit, we used modification indices to identify areas where model fit could be improved by relaxing parameter constraints iteratively and retesting the model after each modification. Subsequently, in all groups with an acceptable model fit, we carried out multigroup confirmatory factor analysis (MGCFA) to test for configural, metric, as well as scalar invariance among countries, between men and women, and among educational levels. In the MGCFA, we tested for metric invariance by relaxing factor loading constraints in noninvariant countries, one at a time, based on modification indices. We followed the MGCFA with the alignment procedure to identify the most noninvariant parameters (Cieciuch et al., 2019). Subsequently, we repeated this procedure for anxiety and stress in countries in which we found metric or partial metric invariance of the FCV-19S.[5] Finally, in all countries, we examined the correlations among latent (invariant) factors of the three scales measuring fear of COVID-19, anxiety, and stress.

In all analyses, we used IBM SPSS 26 and Mplus 7.2 (Muthén & Muthén, 1998–2014). In factor analyses, we used the Robust Maximum Likelihood (MLR) estimator due to: (a) relatively small sample sizes, (b) 7-category response scale (Rhemtulla et al., 2012), and (c) potential deviations from normality (Yuan & Bentler, 2000). Examining model fit, we relied on the most common fit indices: Chi-squared, Comparative fit index (CFI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR), with the following thresholds for acceptable fit: CFI $>$ .95, RMSEA $<$ .10, SRMR $<$ .08 (Brown, 2015; Hu & Bentler, 1999). We implemented a more liberal RMSEA threshold due to its inflated rejection rates of models with small *df* (Kenny et al., 2015), which is congruent with MacCallum et al.'s (1996) suggestion that RMSEA between .08 and .10 indicates a mediocre fit. In the MGCFA comparing gender and educational levels, we relied on the following thresholds for a meaningful difference between the models: ΔCFI = −.002 (Meade et al., 2008), ΔRMSEA = .015 (Chen, 2007). However, given the large number of compared groups, we relied in the cross-cultural MGCFA on more liberal thresholds to test metric invariance (ΔCFI = −.02, ΔRMSEA = .03; Rutkowski & Svetina, 2004). To test scalar invariance, we implemented Meade et al. (2008) criteria. In the alignment optimization, we used 25% of noninvariant parameters as a threshold for trustworthy mean estimations (Cieciuch et al., 2019). In all analyses, we used MGCFA estimations wherever we found invariance with this method. We used scores estimated via the alignment method only when we obtained scalar invariance with MGCFA. Data, study materials, and all analyses codes are available at https://osf.io/hxmzb.

Results

The Fear of COVID-19 Scale Structure Across Countries

We present descriptive statistics for all FCV-19S items in Table 3, indicating that Items 3, 6, and 7 were, to a varying degree, right-

[2] Most participants in each country ($M = 96.17\%$, $SD = 6.46\%$) selected the country's official language (e.g., Italians selected Italian). Latvians were the exception: Only 64.90% of them selected Latvian, with most of the rest (>30%) selecting Russian.

[3] We decided on no participant remuneration due to lack of funding. However, in these two countries, we encountered insurmountable difficulties with data collection, probably due to many competing survey demands. We managed to carry out the surveys after the local collaborators secured funding from their home institutions.

[4] We presented measures in a separate random order for each participant. We checked data quality via three (randomly displayed across the survey) attention-checks (e.g., "This question is for checking your attention. Please mark number 2"). Wrong responses to any of the three items resulted in exclusion.

[5] Using anxiety and stress as criteria requires correlational analysis. Correlation coefficients are comparable between groups only when both correlated variables are invariant on the metric level. Therefore, we analyzed the structure of STAI-6 and PSS-4 only in countries (43 out of 48) in which we found metric invariance for the FCV-19S. We obtained partial metric invariance in 40 countries for STAI-6 and in 33 countries for PSS-4. We present results of the MGCFA analyses for STAI-6 and PSS-4 Supplemental Material. Detailed results of single-group CFAs are available at the OSF page: https://osf.io/hxmzb.

Table 1
Sample Characteristics and Language Selected Across Countries

Country	*N*	% men	M_{age}	SD_{age}	M_{SES}	SD_{SES}	Dominant language
Total	14,557	33.7[a]	31.30	12.12	4.35	1.07	Various
Armenia	182	35.7	29.63	10.52	4.42	1.12	Armenian
Australia	142	44.4	47.15	17.90	3.95	1.27	English
Austria	310	47.1	40.21	12.05	4.55	1.30	German
Bangladesh	403	56.8	24.29	5.87	3.88	0.70	Bangla
Bosnia and Hercegovina	330	34.8	28.32	11.18	5.01	1.10	Bosnian
Brazil	375	23.5	35.14	12.75	4.34	1.14	Brazilian Portuguese
Bulgaria	282	29.1	36.45	9.97	4.62	0.99	Bulgarian
Chile	220	33.2	30.65	9.98	4.39	1.08	Spanish
China	225	33.3	29.57	11.56	3.93	1.04	Chinese
Colombia	127	41.7	21.80	10.30	5.77	0.91	Spanish
Croatia	239	39.3	36.94	14.70	5.02	1.15	Croatian
Czech	445	18	35.33	13.11	4.60	1.04	Czech
Ecuador	667	36.1	25.73	8.49	4.17	0.89	Spanish
Estonia	261	26.1	40.31	12.69	4.60	1.17	Estonian
Ghana	121	79.3	32.31	6.53	4.07	1.26	English
Hungary	118	10.2	39.59	13.53	4.58	1.02	Hungarian
India	328	49.1	29.78	8.97	4.27	1.08	English
Indonesia	350	22	23.49	8.13	4.53	0.99	Indonesian
Iran	177	46.9	26.50	6.28	4.07	1.13	Farsi
Iraq	146	60.3	29.06	7.29	4.09	1.03	Kurdish
Israel	162	38.3	40.86	16.12	5.02	1.17	Hebrew
Italy	106	23.6	40.08	17.33	4.23	0.89	Italian
Japan	269	79.6	19.82	2.92	4.14	1.11	Japanese
Kazakhstan	242	42.6	26.66	9.27	4.32	1.14	Russian
Latvia	163	30.1	37.80	12.17	4.41	0.95	Latvian
Lebanon	103	20.4	28.55	9.58	4.41	1.06	English
Malaysia	124	18.5	25.65	8.05	4.20	1.02	English
Nigeria	180	45	34.36	9.86	4.37	1.06	English
Pakistan	191	36.6	24.30	5.89	4.69	1.12	Urdu
Peru	151	29.8	29.29	11.42	3.25	1.19	Spanish
Philippines	188	33.5	36.46	13.88	4.78	0.82	Filipino
Poland	279	34.1	31.21	11.69	4.70	1.11	Polish
Portugal	1,285	1.7	31.55	8.27	4.18	0.91	Portuguese
Romania	283	24.4	32.55	11.82	4.59	0.97	Romanian
Russia	332	16.6	33.83	12.23	3.81	1.18	Russian
Serbia	872	59.6	24.78	9.72	4.53	1.14	Serbian
Slovakia	227	11	42.66	12.25	4.53	0.91	Slovakian
Slovenia	422	17.3	35.90	11.12	4.16	1.03	Slovenian
Republic of South Africa	992	44	32.86	11.92	3.15	1.40	English
Spain	564	14.5	38.04	14.14	4.06	1.06	Spanish
Thailand	212	38.2	27.50	8.21	4.18	1.06	Thai
Togo	154	55.2	32.10	6.33	3.95	1.14	French
Turkey	399	30.1	25.10	7.27	4.34	0.97	Turkish
Ukraine	340	26.5	27.68	11.44	4.20	1.15	Ukrainian
United Arab Emirates	165	29.7	29.42	7.14	4.44	1.27	English
U.K.	259	29.3	34.96	12.14	4.15	1.16	English
Uruguay	160	43.8	43.61	15.28	4.89	0.87	Spanish
Vietnam	279	70.6	21.85	6.40	4.05	1.03	Vietnamese

Note. SES = socioeconomic status.
[a] 0.60% “other” or unreported.

skewed. The initial single-factor model fitted the data poorly in all countries, except Russia, where it was acceptable (Table S1, Supplemental Material). Therefore, we modified models for each country, relaxing error covariances, based on modification indices.[6] The suggested modification indices repeatedly revealed several covariances which, estimated freely, improved the model fit [between errors of Items 1 and 2; of Items 1 and 4; of Items 2 and 5 (psychological aspects of fear), and of Items 3, 6, and 7 (physiological aspects of fear)]. These results appear to suggest a

[6] Given that relaxing error covariances is regarded by some (Sellbom & Tellegen, 2019) as a somewhat controversial practice, we also applied the alternative strategy of dropping items that we considered redundant based on modification indices. We tested both single-factor and two-factor solutions, iteratively dropping Items 1, 2, and 6. Out of the alternative solutions that we tested, a five-item, two-factor model (with Items 4 and 5 measuring psychological aspects of fear and Items 3, 6, and 7 physiological aspects of fear, respectively) fitted the best. Although it was well-fitted in 34 out of 48 countries, the two factors were highly correlated (average ρ = .85, SD_{ρ} = .08). The results are available on the project’s OSF page: https://osf.io/hxmzb.

Table 2
Descriptive Statistics, Reliability, and Correlation Coefficients Between Studied Variables in All Countries

Country	Fear of COVID-19			Anxiety			Stress			Correlations		
	M	*SD*	α	*M*	*SD*	α	*M*	*SD*	α	r_{f-a}	r_{f-s}	r_{a-s}
Armenia	2.47	1.20	0.89	2.91	0.68	0.83	2.83	0.69	0.62	.39**	.27**	.42**
Australia	3.02	1.29	0.91	2.65	0.77	0.91	2.65	0.73	0.78	.23**	.22**	.60**
Austria	1.91	0.87	0.84	2.67	0.74	0.88	2.47	0.80	0.82	.46**	.38**	.70**
Bangladesh	3.49	1.39	0.90	2.90	0.78	0.86	2.84	0.75	0.69	.28**	.20**	.67**
Bosnia and Hercegovina	2.23	1.07	0.87	2.64	0.63	0.87	2.75	0.60	0.62	.20**	.09	.50**
Brazil	3.95	1.20	0.88	3.14	0.64	0.85	3.04	0.71	0.75	.50**	.30**	.64**
Bulgaria	2.56	1.04	0.86	2.69	0.66	0.88	2.6	0.63	0.77	.44**	.36**	.62**
Chile	3.32	1.36	0.89	3.04	0.73	0.88	2.84	0.80	0.82	_.34_**	_.18_**	_.69_**
China	3.32	1.20	0.89	2.71	0.52	0.79	2.71	0.59	0.71	.22**	.35**	.60**
Colombia	3.09	1.23	0.86	2.86	0.66	0.85	2.69	0.74	0.74	.31**	.21**	.56**
Croatia	2.19	1.01	0.88	2.63	0.65	0.87	2.68	0.63	0.61	.27**	.24**	.54**
Czech	2.11	0.91	0.85	2.74	0.72	0.92	2.68	0.76	0.81	.40**	.35**	.70**
Ecuador	3.69	1.38	0.90	2.84	0.66	0.83	2.80	0.65	0.67	.34**	.27**	.56**
Estonia	2.03	0.90	0.88	2.53	0.65	0.86	2.49	0.71	0.83	.34**	.27**	.71**
Ghana	3.45	1.51	0.90	2.43	0.63	0.77	2.65	0.60	0.46	.52**	_.31_**	_.47_**
Hungary	2.37	1.07	0.87	2.99	0.77	0.87	2.78	0.75	0.81	.45**	.40**	.63**
India	3.17	1.32	0.89	2.73	0.67	0.81	2.76	0.64	0.54	.41**	_.32_**	_.56_**
Indonesia	3.21	1.07	0.84	2.86	0.59	0.81	2.83	0.62	0.73	.29**	.25**	.61**
Iran	3.01	1.29	0.88	2.94	0.72	0.88	2.96	0.66	0.69	.22**	.16*	.60**
Iraq	2.86	1.17	0.85	2.91	0.80	0.87	2.70	0.61	0.54	.15	.23**	.42**
Israel	2.37	1.05	0.87	2.85	0.74	0.91	2.53	0.68	0.68	_.48_**	_.36_**	_.71_**
Italy	2.70	1.07	0.89	2.89	0.67	0.87	2.78	0.75	0.82	_.43_**	_.31_**	_.69_**
Japan	4.11	1.06	0.83	2.88	0.53	0.57	2.99	0.47	0.27	_.19_**	_.08_	_.41_**
Kazakhstan	2.61	1.11	0.85	2.58	0.65	0.84	2.65	0.73	0.75	.28**	.17*	.50**
Latvia	3.81	1.30	0.92	2.99	0.49	0.77	2.92	0.51	0.57	.41**	_.28_**	_.68_**
Lebanon	2.98	1.20	0.85	3.40	0.67	0.88	3.31	0.74	0.80	.09	.06	.68**
Malaysia	3.47	1.17	0.87	2.92	0.54	0.82	2.90	0.65	0.77	.18	.12	.53**
Nigeria	2.86	1.42	0.92	2.42	0.63	0.79	2.54	0.67	0.65	.29	.24	.54**
Pakistan	3.19	1.35	0.92	2.72	0.56	0.64	2.78	0.53	0.16	.13	.25**	.21**
Peru	3.81	1.35	0.88	2.86	0.66	0.85	2.77	0.66	0.65	.31**	.32**	.60**
Philippines	3.84	1.29	0.89	2.78	0.58	0.82	2.81	0.62	0.60	_.38_**	_.24_**	_.57_**
Poland	2.13	0.90	0.82	2.94	0.75	0.88	2.87	0.82	0.81	.39**	.27**	.68**
Portugal	3.52	1.20	0.86	3.07	0.64	0.87	2.86	0.73	0.81	.38**	.31**	.64**
Republic of South Africa	4.47	1.60	0.91	2.84	0.63	0.65	3.04	0.61	0.29	.37**	.31**	.61**
Romania	2.68	1.16	0.90	2.65	0.59	0.86	2.67	0.64	0.74	.41**	.22**	.55**
Russia	2.52	0.99	0.83	2.81	0.67	0.88	2.89	0.75	0.79	.31**	.21**	.57**
Serbia	1.84	0.89	0.84	2.44	0.72	0.85	2.70	0.71	0.65	_.35_**	_.37_**	_.59_**
Slovakia	2.57	0.94	0.87	2.52	0.56	0.83	2.58	0.60	0.67	_.38_**	_.30_**	_.63_**
Slovenia	2.36	1.15	0.89	2.51	0.76	0.90	2.62	0.77	0.81	.23**	_.31_**	_.74_**
Spain	2.96	1.31	0.90	3.04	0.79	0.89	2.89	0.93	0.86	.37**	.29**	.70**
Thailand	3.27	1.28	0.90	2.92	0.59	0.80	2.94	0.63	0.60	_.23_**	.32**	_.49_**
Togo	3.56	1.65	0.91	2.74	0.57	0.76	2.74	0.60	0.55	.20*	_.20_*	_.60_**
Turkey	3.05	1.35	0.90	2.99	0.67	0.84	3.09	0.62	0.62	.31**	.16**	.46**
Ukraine	2.42	1.00	0.83	2.71	0.66	0.86	2.75	0.66	0.71	.27**	.22**	.60**
United Arab Emirates	4.27	1.03	0.86	3.32	0.60	0.77	2.80	0.61	0.76	.40**	.36**	.47**
U.K.	2.94	1.27	0.91	2.80	0.76	0.91	2.85	0.75	0.76	.44**	_.38_**	_.79_**
Uruguay	2.39	0.97	0.87	2.60	0.60	0.84	2.28	0.67	0.74	.14	.05	.62**
Vietnam	3.78	1.34	0.88	2.87	0.54	0.82	2.82	0.57	0.65	.17**	.26**	.46**

Note. We calculated correlation coefficients based on latent factor scores estimated via MGCFA. We used italics to designate correlation coefficients calculated with observed means due to the noninvariance of one of the measures. r_{f-a} = correlation between the FCV-19S and STAI-6, r_{f-s} = correlation between the FCV-19S and PSS-4, r_{a-s} = correlation between STAI-6 and PSS-4. COVID-19 = coronavirus disease; MGCFA = multigroup confirmatory factor analysis; FCV-19s = Fear of COVID-19 Scale; STAI-6 = State-Trait Anxiety Inventory 6; PSS-6 = Perceived Stress Scale 4.
$^{*}p < .05$. $^{**}p < .01$.

two-factor structure, with one factor pertinent to psychological aspects of fear and the other factor pertinent to physiological aspects of fear (as in prior research; Iversen et al., 2021). We explored this potential two-factor structure (see Table S2, Supplemental Material for CFAs results), which showed improved global fit. However, we failed to replicate this solution in every country: in most countries, the same covariances as in the single-factor model needed to be relaxed to improve fit, and the two factors were highly correlated (average ρ = .78, SD_{ρ} = .09), which might result in multicollinearity issues in future studies, thus limiting the utility of the scale (Vatcheva et al., 2016).[7] We considered this a cue that the scale is unifactorial but

[7] Noticeable exceptions were Iran (r = .59), Japan (r = .59), and United Arab Emirates (r = .49).

Table 3
Item-Level Descriptive Statistics of Fear of COVID-19 Scale

Item	*M* [range]	*SD* [range]	Skewness [range]	Kurtosis [range]
1. I am most afraid of COVID-19	3.71 [1.83, 5.60]	1.60 [1.01, 2.06]	0.07 [−1.06, 1.58]	−0.42 [−1.29, 3.25]
2. It makes me uncomfortable to think about COVID-19	3.96 [2.45, 5.80]	1.69 [1.04, 2.10]	−0.13 [−0.89,0.98]	−0.81 [−1.42, 1.37]
3. My hands become clammy when I think about COVID-19	2.20 [1.27, 4.01]	1.29 [0.69, 2.04]	1.33 [−0.22, 2.77]	2.16 [−1.44, 11.39]
4. I am afraid of losing my life because of COVID-19	3.17 [1.43, 5.13]	1.69 [0.86, 2.25]	0.56 [−0.87, 2.81]	0.06 [1.49, 9.53]
5. When I watch news and stories about COVID-19 on social media, I become nervous or anxious	3.55 [2.25, 5.70]	1.73 [1.27, 2.11]	0.11 [−1.22, 1.02]	−0.87 [−1.45, 1.51]
6. I cannot sleep because I'm worrying about getting COVID-19	2.07 [1.21, 3.41]	1.27 [0.67, 1.98]	1.56 [−0.08, 4.57]	3.16 [−1.47, 25.82]
7. My heart races or palpitates when I think about getting COVID-19	2.35 [1.25, 3.92]	1.45 [0.76, 2.05]	1.26 [−0.25, 3.58]	1.64 [−1.37, 13.49]

Note. Detailed descriptive statistics for all items across studied countries can be found in the project's OSF page: https://osf.io/hxmzb. COVID-19 = coronavirus disease.

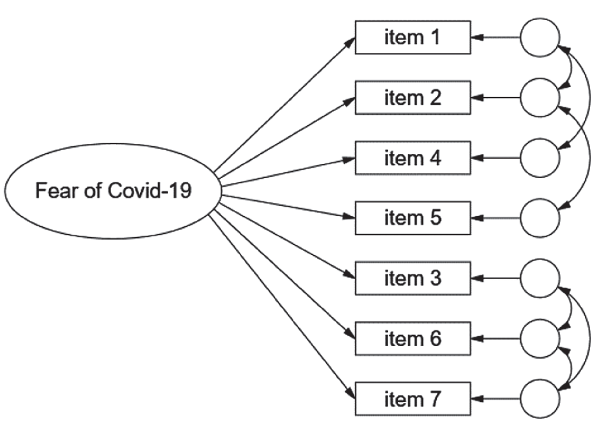
that there may be other (than fear of COVID-19) sources of inter-correlations between items. Although testing the invariance of different baseline models across groups is a valid approach, the purpose of this research was to arrive at a broad, cross-culturally comparable solution of FCV-19S. Therefore, to achieve a model applicable to all studied groups (Figure 1), we relaxed the abovementioned six covariances most commonly indicated by modification indices. Given this exploratory approach, we opted not to relax any more covariances.[8] This modified single-factor model (Table 4) was well-fitted to the data in 43 out of 48 countries (exceptions: Chile, Israel, Italy, Slovakia, Slovenia).[9]

Group-Level Measurement Invariance

After establishing an acceptable model fit (i.e., our modified single-factor model), we tested, using an MGCFA, whether it is cross-culturally invariant in 43 of the 48 countries (exceptions, as above, were: Chile, Israel, Italy, Slovakia, Slovenia). We obtained configural invariance between those countries. Moreover, we found partial metric invariance after relaxing several factor loadings [17 (5.65%)] and excluding Serbia, but we obtained no scalar invariance (Table 5). Thus, we followed MGCFA with the alignment procedure in which we examined the noninvariance on two levels, looking for items that were noninvariant most often and for countries in which most items were noninvariant. The basic assumption of the alignment procedure is the configural invariance of the model; therefore, we tested it on 43 out of 48 countries again (including Serbia). It showed that, in total, 7.31% of factor loadings were noninvariant [mostly in Latvia (4), Serbia (4), and the Republic of South Africa (3)], supporting the partial metric invariance obtained in the MGCFA. Moreover, 24.92% of intercepts were noninvariant[10] (mostly Items 1 and 4—see Table 6), which shows that means can be estimated and compared with trustworthiness (keeping 25% of the noninvariant intercepts as the threshold of acceptability). We present latent mean levels of fear of COVID-19 across 43 countries in Table 2. We display in Figure 2 distributions of approximate scores estimated with the alignment procedure across countries.

In addition, we compared the fit of the three tested models in both genders and at different educational levels. First, we removed the 85 participants who reported "other" for gender. Again, our 1-factor modified model was the best fit in both genders (Table 7). We found partial scalar invariance after relaxing Items' 2, 3, and 5 intercepts

Figure 1
The Modified Model of the Fear of COVID-19 Scale Tested in Multigroup Confirmatory Factor Analyses



Note. COVID-19 = coronavirus disease.

[8] We present estimated correlation coefficients between listed error terms in Table S3, Supplemental Material.

[9] In those countries, single-factor, two-factor, and modified single-factor models were not well-fitted to the data. Thus, we exploratorily searched for the best-fitted model in each country. A two-factor model, with several error covariances relaxed, fit best in Chile (covariances: 1 + 4, 3 + 6, 2 + 4, 2 + 7), Slovakia (1 + 2 and 2 + 5), and Slovenia (1 + 2, 2 + 5, 5 + 7). In Israel, a 1-factor with correlations (3 + 6 + 7 and 4 + 5) fit best. We found no acceptably fitted model in Italy.

[10] In Bulgaria, Czech Republic, Kazakhstan, Poland, Portugal, and Turkey, four out of seven intercepts were non-invariant. We suggest interpreting means for those countries with caution.

Table 4
Separate Confirmatory Factor Analyses in All Studied Countries: Single-Factor Model With Modifications

Country	χ^2	CFI	RMSEA	90% CI	SRMR	Factor loadings
Armenia	13.02	.989	.059	[.000–.114]	.021	.58–.81
Australia	16.27	.978	.085	[.019–.145]	.027	.67–.87
Austria	7.43	1.00	.000	[.000–.064]	.013	.58–.78
Bangladesh	28.5	.984	.080	[.049–.112]	.020	.66–.83
Bosnia and Hercegovina	14.89	.989	.051	[.000–.091]	.017	.55–.84
Brazil	9.44	.999	.022	[.000–.067]	.014	.63–.77
Bulgaria	15.35	.990	.057	[.000–.100]	.014	.36–.83
Chile	38.94	.955	.133	[.093–.176]	.031	.57–.82
China	10.05	.997	.034	[.000–.089]	.019	.59–.77
Colombia	7.59	1.00	.000	[.000–.101]	.020	.53–.90
Croatia	20.33	.978	.080	[.037–.124]	.028	.61–.86
Czech	39.64	.959	.094	[.066–.124]	.026	.62–.81
Ecuador	21.58	.994	.050	[.025–.077]	.015	.62–.85
Estonia	27.41	.968	.096	[.058–.137]	.026	.61–.80
Ghana	8.39	.999	.020	[.000–.110]	.021	.59–.83
Hungary	8.37	.999	.020	[.000–.111]	.021	.58–.74
India	31.09	.966	.094	[.060–.130]	.032	.62–.82
Indonesia	11.83	.995	.037	[.000–.078]	.020	.49–.82
Iran	17.1	.979	.080	[.024–.133]	.032	.51–.86
Iraq	15.52	.979	.080	[.002–.140]	.033	.56–.76
Israel	33.54	.932	.140	[.093–.191]	.041	.53–.76
Italy	31.19	.929	.165	[.107–.228]	.041	.62–.79
Japan	4.77	1.00	.000	[.000–.048]	.020	.33–.96
Kazakhstan	15.09	.987	.061	[.000–.107]	.029	.45–.77
Latvia	8.75	.998	.024	[.000–.097]	.021	.21–.93
Lebanon	15.21	.970	.094	[.000–.165]	.028	.58–.86
Malaysia	17.42	.970	.097	[.032–.160]	.030	.60–.90
Nigeria	12.95	.992	.059	[.000–.115]	.018	.69–.84
Pakistan	11.64	.992	.049	[.000–.115]	.018	.67–.90
Peru	10.33	.993	.044	[.000–.111]	.028	.51–.84
Philippines	17.97	.984	.081	[.030–.132]	.027	.51–.88
Poland	24.52	.970	.086	[.049–.126]	.022	.44–.81
Portugal	28.36	.994	.045	[.027–.063]	.012	.61–.76
Romania	13.97	.992	.051	[.000–.095]	.016	.65–.76
Russia	9.41	.998	.023	[.000–.071]	.014	.40–.72
Serbia	24.94	.986	.049	[.028–.072]	.020	.54–.79
Slovakia	26.35	.966	.101	[.060–.144]	.028	.47–.81
Slovenia	48.15	.961	.109	[.081–.140]	.027	.67–.81
South Africa	23.67	.994	.044	[.024–.066]	.013	.60–.91
Spain	18.76	.994	.049	[.020–.078]	.013	.61–.86
Thailand	11.99	.994	.049	[.000–.101]	.014	.66–.89
Togo	11.68	.992	.055	[.000–.117]	.019	.70–.82
Turkey	20.66	.991	.063	[.030–.097]	.013	.62–.85
Ukraine	16.25	.987	.055	[.012–.094]	.022	.53–.72
United Arab Emirates	18.85	.979	.091	[.037–.144]	.028	.50–.87
United Kingdom	15.52	.990	.060	[.002–.105]	.021	.71–.84
Uruguay	8.62	.998	.022	[.000–.097]	.022	.61–.77
Vietnam	6.01	1.00	.000	[.000–.058]	.009	.54–.79

Note. Covariances estimated freely: 3 + 6, 3 + 7, 6 + 7, 1 + 2, 1 + 4, 2 + 5; $df = 8$. CFI = Comparative fit index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual.

among women. Second, we compared model fit across educational levels and found that the 1-factor modified model fitted the best, with slightly worse fit in "primary education" and "doctoral" groups. We found partial scalar invariance across educational levels, after relaxing intercepts of Items 2 and 5 in the Bachelor's and Master's degree groups, Items 2 and 4 in the doctoral group, and Item 1 in the upper secondary degree group (Table 8).

Relations With External Criteria

Lastly, we used our modified measurement model to examine individual differences in fear of COVID-19. We examined gender differences (independent samples *t*-test, using partially scalar invariant latent factor scores of FCV-19S), educational level differences (one-way Analysis of Variance with Bonferroni correction, using partially scalar invariant latent factor scores of FCV-19S), and correlations (Pearson's *r*, using partially metric invariant latent factor scores of FCV-19S) with anxiety and stress. Women feared COVID-19 more than men, $t(14{,}467) = 11.92$, $p < .001$, Cohen's $d = 0.21$. Participants with the least education feared COVID-19 the most, $F(5, 14{,}550) = 68.81$, $p < .001$, $\eta^2 = .023$, and this relation was linear (Supplementary Material, Figure S1). Also, fear of COVID-19 was positively related to anxiety and stress in most countries

Table 5
Multigroup Confirmatory Factor Analysis of Fear of COVID-19 Scale in 43 Countries

Invariance level	χ^2	CFI	RMSEA	90% CI	SRMR
Multigroup confirmatory factor analysis					
Configural (df = 344)	624.23	.989	.057	[.051–.063]	.020
Metric (df = 596)	1470.38	.966	.076	[.072–.081]	.084
Partial metric (df = 581)	1169.98	.976	.065	[.061–.070]	.062
Scalar (df = 848)	5477.74	.823	.146	[.143–.150]	.136
	$\Delta\ \chi^2$	Δ CFI	Δ RMSEA	Δ SRMR	$\Delta\ df$
Levels of invariance comparison					
Configural versus metric	986.90	−.023	.019	.064	252
Configural versus partial metric	666.10	−.013	.008	.042	237
Partial metric versus scalar	4642.97	−.137	.076	.065	252

Note. N = 13,419. All χ^2 difference tests were significant at $p < .001$. Samples not used in MGCFA: Chile, Israel, Italy, Slovakia, Slovenia, Serbia. COVID-19 = coronavirus disease. CFI = Comparative fit index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual.

(except Japan and Uruguay), both in men and women and at different educational levels (Tables 7 and 8).

Discussion

Given the extensive, cross-cultural use of the FCV-19S (Ahorsu et al., 2020) in different populations, we set to find out if the results obtained are comparable across cultures, genders, and educational levels by inspecting the scale's measurement invariance. In particular, we tested FCV-19S's cross-cultural, cross-gender, and cross-educational replicability in 48 countries. We supplemented our analyses by using external criteria, and specifically anxiety and stress, as important correlates of fear of COVID-19 (Ahorsu et al., 2020; Satici et al., 2020; Tsipropoulou et al., 2020). Based on prior research, we expected that women (vs. men) and persons with lower (vs. higher) educational levels would experience more fear.

The FCV-19S Structure Across Countries, Genders, and Educational Levels

We did not replicate the unifactorial structure of the scale, proposed in the original study (Ahorsu et al., 2020), in any of our samples. The literature on the FCV-19S has reported both a one-factor and a two-factor solution. As such, we pitted a one-factor against a two-factor model. The one-factor uncorrelated solution did not fit the data well, as the items formed two groups: one related to psychological aspects (Items 1, 2, 4, 5) and one to physiological aspects (Items 3, 6, 7) of fear. Further analyses did not support the two-factor solution either, indicating nonoptimal (Vatcheva et al., 2016) high correlation between the two factors. Thus, the final model that we propose is unifactorial, yet includes additional correlations among or between items (Items 3, 6, 7; Items 1, 2; Items 1, 4; Items 2, 5). This modified single-factor solution indicates that fear of the COVID-19, as measured by the FCV-19S, is a rather homogenous, or at least a general, phenomenon. Finally, the FCV-19S had good reliability (Tables 2, 7, and 8).

Additional analyses offered insights into cross-cultural differences in the measurement of fear of COVID-19, revealing, in some countries, deviations from the single-factor modified model that we propose. This model did not fit the data well in Chile, Israel, Italy, Slovakia, and Slovenia. Different models fit best in these countries, with relatively similar 2-factor solutions fitting in Slovakia and Slovenia, but a different 2-factor solution fitting in Chile. In Israel, a 1-factor solution fitted best, although still not meeting the criteria for acceptable fit. Moreover, no factorial solution fit in Italy, despite exploring several variations of 1-factor and 2-factor models.

Comparability of FCV-19S Results Across Countries, Genders, and Educational Levels

The modified single-factor solution showed a considerable level of equivalence across countries (partial metric invariance—in 43 of 48 countries), genders (partial scalar invariance), and educational levels (scalar invariance). The single-factor modified solution, then, assures reliable comparisons among countries or groups. In particular, metric invariance allows for reliable comparisons of predictors and consequences of fear of COVID-19 across different countries. Although not scalar-invariant, the results of the alignment procedure suggest that comparable mean levels of fear of COVID-19 can be trustworthily estimated cross-culturally. Partial scalar invariance allows for comparing levels of fear across genders and educational groups.

Our findings partially replicated Lin et al. (2021) results, as we obtained partial scalar invariance for gender. However, unlike Lin et al., we obtained only metric levels of cross-country invariance using the MGCFA approach. We collected data from more countries than Lin et al., and the number of countries or group tested diminishes the likelihood of uncovering scalar invariance (Cieciuch et al., 2019). Yet, we were able to compare indirectly levels of latent scores across countries using the alignment approach. Cross-country ranking of fear of COVID-19 differed somewhat between the studies. We provided an illustration in reference to Bangladesh. In our study, level of fear of COVID-19 in Iran was in the middle of the country rankings and lower than in Bangladesh (Figure 2); however, in Lin et al., level of fear of COVID-19 was at the top of the country rankings and higher than in Bangladesh.

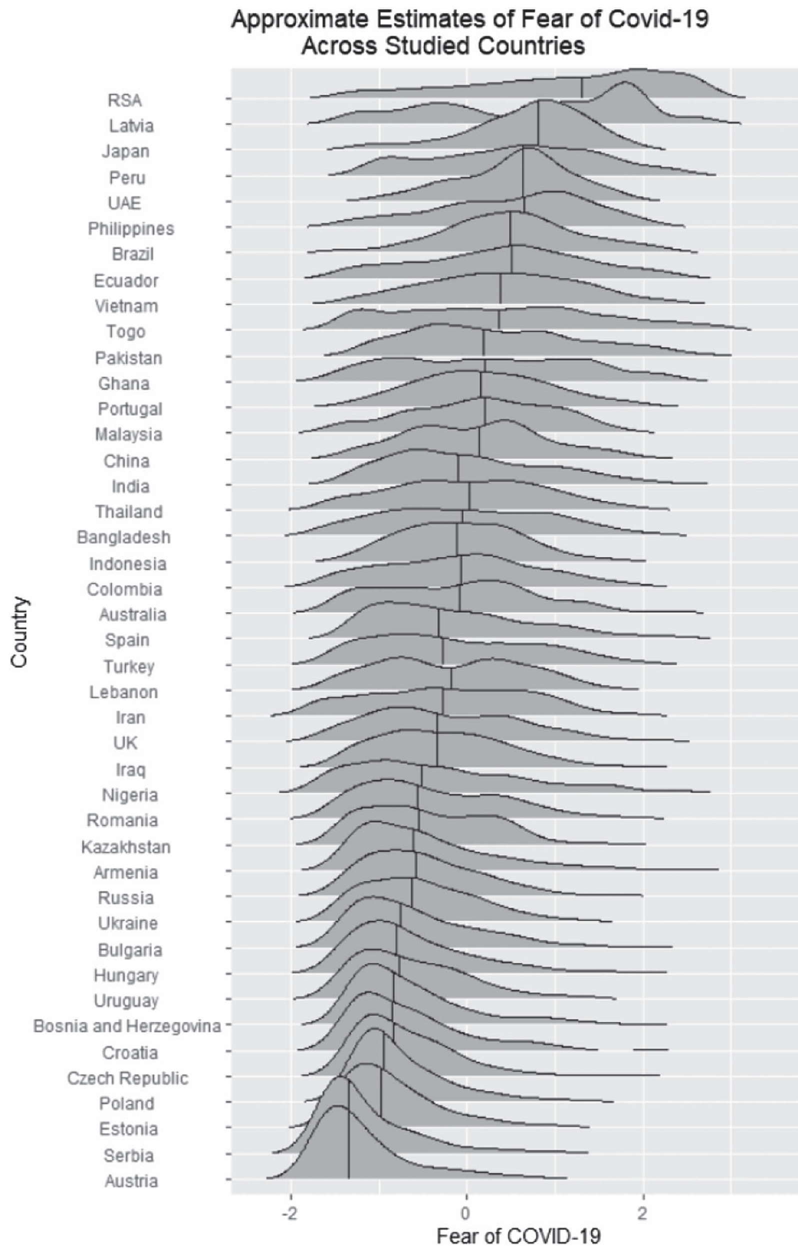
Table 6
Approximate Measurement (Non)Invariance for Loadings and Intercepts Over Countries

Country	Alignment statistics			Noninvariant factor loadings								Non-invariant intercepts							
	Overall	rank	M_{align}	*f1*	*f2*	*f3*	*f4*	*f5*	*f6*	*f7*	Sum	*f1*	*f2*	*f3*	*f4*	*f5*	*f6*	*f7*	Sum
	Sum: countries			4	3	5	3	1	3	3	22	20	14	4	24	12	1	0	75
	Percent			9,30	6,98	11,63	6,98	2,33	6,98	6,98	7,31	46,51	32,56	9,30	55,81	27,91	2,33	0	24,92
	Fit function contribution			−384.69	−414.24	−428.81	−379.96	−361.52	−418.85	−388.04		−655.99	−548.27	−506.88	−555.01	−520.63	−410.16	−367.06	
	R^2			.540	.142	.650	.620	.438	.638	.710		.705	.652	.857	.830	.678	.941	.944	
Republic of South Africa		1	1.12								0	×			×				2
Latvia		2	0.78		×	×		×	×		4	×	×						1
Japan		3	0.68								0								2
Peru		4	0.55								0								1
United Arab Emirates		5	0.54								0	×	×			×			3
Philippines		6	0.51								0					×			2
Brazil		7	0.50								0	×	×						4
Ecuador		8	0.41								0					×			0
Vietnam		9	0.40								0	×							0
Togo		10	0.38			×					1								3
Pakistan		11	0.35								0	×	×		×				4
Ghana		12	0.26								0				×				1
Portugal		13	0.20							×	1	×	×	×		×			2
Malaysia		14	0.15								0								1
China		15	0.11			×					1								2
India		16	0.03								0			×	×				2
Thailand		17	0.01								0								2
Bangladesh		18	0.00			×					1				×				0
Indonesia		19	−0.06								0		×		×				1
Colombia		20	−0.07								0								0
Australia		21	−0.12								0				×				4
Spain		21	−0.12							×	1		×		×				2
Turkey		21	−0.12	×			×				2	×	×		×	×			0
Lebanon		24	−0.16								0								0
Iran		25	−0.20								0								3
U.K.		26	−0.22								0				×				3
Iraq		27	−0.27								0				×				0
Nigeria		28	−0.29								0	×		×	×				1
Romania		29	−0.38								0	×	×						4
Kazakhstan		30	−0.44								0	×	×		×	×			4
Armenia		31	−0.46								0	×			×				2
Russia		32	−0.49	×	×		×		×		4	×			×	×			2
Ukraine		33	−0.54						×		1	×							3
Bulgaria		34	−0.58		×						1	×	×		×	×			2
Hungary		35	−0.61								0				×	×			2
Bosnia and Hercegovina		36	−0.62								0	×			×				0
Uruguay		36	−0.62								0				×				0
Croatia		38	−0.66								0	×			×		×		4
Czech		39	−0.68								0	×		×	×	×			1
Poland		40	−0.73								0	×	×		×	×			3
Estonia		41	−0.82								0	×			×				1
Serbia		42	−1.10	×		×	×				3		×			×			1
Austria		43	−1.15	×						×	2		×		×				1

Note. M_{align} = estimation derived from alignment optimization in which Bangladesh was used as a reference group. *f1*–*f7*—items of the Fear of COVID-19 Scale. Sum: countries = number of countries in which parameter was non-invariant. Percent = proportion of countries in which parameter was non-invariant. Sum = number of items noninvariant in given country.

Figure 2

Distributions of Fear of COVID-19 Scores Estimated With the Alignment Procedure Across 43 Countries



Note. Vertical lines represent medians. COVID-19 = coronavirus disease.

Lack of scalar invariance could stem from different sources, from translation issues to referring to different experiences (Oshio, 2010). The most noninvariant items were 1 = *I am most afraid of the COVID-19* and 4 = *I am afraid of losing my life because of COVID-19*, which referred to psychological aspects of fear of COVID-19. Therefore, these two items were mostly responsible for the lack of scalar invariance, implying that participants from different countries answered these questions in an incomparable manner. Items referring to physiological aspects of fear were less problematic, which means that they were understood similarly in different countries. Moreover, in all samples, we observed distinct distributions of scoring on the two aspects of fear: scoring on items measuring psychological aspects of fear was normally distributed, whereas scoring on items measuring physiological aspects of fear was right-skewed.

Relationship With External Criteria

Finally, the study confirmed the validity of the FCV-19S. Replicating prior research (Sakib et al., 2020), women (vs. men) experienced more fear of COVID-19. We also found that less

Table 7

Confirmatory Factor Analysis and Multi-Group Confirmatory Factor Analysis in Men and Women: Single-Factor Model With Modifications

Separate confirmatory factor analyses

Gender	χ^2	CFI	RMSEA	90% CI	SRMR	Factor loadings
Men	65.40	.996	.038	[.030–.047]	.009	.72–.82
Women	135.29	.995	.041	[.035–.047]	.009	.69–.80

Multigroup confirmatory factor analysis

Invariance level	χ^2	CFI	RMSEA	90% CI	SRMR	Factor loadings
Configural (df = 16)	191.79	.995	.039	[.034–.044]	.009	—
Metric (df = 22)	262.94	.994	.039	[.035–.043]	.016	—
Scalar (df = 28)	682.00	.983	.057	[.053–.061]	.028	—
Partial scalar (df = 25)	289.87	.993	.038	[.034–.042]	.017	—

Levels of invariance comparison

	Δ χ^2	Δ CFI	Δ RMSEA	Δ SRMR	Δ df
Configural versus metric	71.15	−.001	.000	.007	6
Metric versus scalar	419.06	−.011	.018	.012	6
Metric versus partial scalar	26.93	−.001	−.001	.001	3

Descriptive statistics

	Fear of COVID			Anxiety			Stress			Correlations		
	M	SD	α	M	SD	α	M	SD	α	r_{f-a}	r_{f-s}	r_{a-s}
Men	2.90	1.50	.92	2.64	0.68	.81	2.70	0.68	.63	.34**	.30**	.53**
Women	3.11	1.38	.90	2.89	0.69	.86	2.84	0.72	.73	.34**	.29**	.59**

Note. N = 14,470; covariances estimated freely: 3 + 6, 3 + 7, 6 + 7, 1 + 2, 1 + 4, 2 + 5; df = 8. We excluded 85 participants from the analysis for not reporting sex or reporting "other." χ^2 difference tests were both significant, $p < .001$. We calculated correlation coefficients based on latent factor scores estimated with MGCFA. r_{f-a} = correlation between the FCV-19S and STAI-6, r_{f-s} = correlation between the FCV-19S and PSS-4, r_{a-s} = correlation between STAI-6 and PSS-4. STAI-6 = State-Trait Anxiety Inventory 6; FCV-19s = Fear of COVID-19 Scale; PSS-6 = Perceived Stress Scale 4; CFI = Comparative fit index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual.
** $p < .01$.

(vs. more) educated participants experienced increased fear of COVID-19. This may be due to less-educated participants having reduced access to health care and to customized (i.e., adapted to their medical knowledge) health promotion media messages (Oliver & Mossialos, 2004), as well as their weaker tendency to respond to such messages (Iversen & Kraft, 2006) or engage in self-management in illnesses (Adams, 2010). Similarly, a positive relation of general anxiety and stress with fear of COVID-19 is consistent with prior findings regarding fear of COVID-19 measured both with the FCV-19S (Ahorsu et al., 2020; Satici et al., 2020) and a single-item scale (Fitzpatrick et al., 2020). Notably, the strength of those relationships distinguishes fear of COVID-19 from general anxiety and stress: mean r was .32 for the relationship between fear of COVID-19 and anxiety, and .26 for the relationship between fear of COVID-19 and stress. These result patterns confirm the divergent validity of FCV-19S.

Limitations and Future Directions

Although we collected data in many countries, our samples were convenient rather than representative, and relatively small. Also, the gender balance was not optimal, as most participants were women. Further, most participants were well-educated, as less educated participants likely had reduced access to the internet. (The online character of our study was necessitated by the pandemic.) Sample characteristics were related to model fit (Supplementary Material, Table S8), showing that it was negatively related to age (i.e., better fit in younger samples) and gender (i.e., better fit in samples consisting of women). Examining the utility of the FCV-19S in specific populations (such as the elderly or persons with chronic illnesses) is a promising line of inquiry. As we did not control for response-style bias, we could not rule out that the results might have been, to some extent, distorted. Future research with this scale could adjust the scores accordingly (e.g., controlling for acquiescence bias with anchoring vignettes; He et al., 2017). Moreover, given that the pandemic did not spread evenly across the world, there were country differences in infection rates. Infection rates were on the rise in some countries (e.g., Brazil, Ecuador), but had stabilized in others (e.g., Austria, Slovenia), during our data collection period. Therefore, future validational work would also do well to compare the structure of the FCV-19S in the same country, but in different time periods.

Our results indicate that the FCV-19S items do not form one clear, uncorrelated factor, suggesting some heterogeneity in the measurement model. We obtained the proposed solution with a data-driven strategy of correlating errors based on

Table 8

Confirmatory Factor Analysis and Multi-Group Confirmatory Factor Analysis in Different Education Levels: Single-Factor Model With Modifications

Separate confirmatory factor analyses

Gender	χ^2	CFI	RMSEA	90% CI	SRMR	Factor loadings
Primary	11.43	.993	.051	[.000–.112]	.026	.62−.86
Lower secondary	6.36	1.00	.000	[.000–.040]	.008	.73−.86
Upper secondary	62.45	.996	.040	[.031–.050]	.009	.73−.83
Bachelor or equivalent	68.04	.996	.037	[.029–.045]	.009	.67−.80
Master or equivalent	41.46	.996	.036	[.025–.047]	.009	.64−.77
PhD	38.33	.985	.070	[.049–.093]	.018	.65−.76

Multigroup confirmatory factor analysis

Invariance level	χ^2	CFI	RMSEA	90% CI	SRMR	Factor loadings
Configural (*df* = 48)	226.08	.995	.039	[.034–.044]	.010	—
Metric (*df* = 78)	362.66	.993	.039	[.034–.043]	.023	—
Scalar (*df* = 108)	652.68	.986	.046	[.042–.049]	.025	—
Partial Scalar(*df* = 101)	463.10	.991	.038	[.035–.042]	.022	—

Levels of invariance comparison

	Δ χ^2	Δ CFI	Δ RMSEA	Δ SRMR	Δ *df*
Configural versus metric	136.58	−.002	.000	.013	30
Metric versus scalar	290.02	−.007	.007	.002	30
Metric versus partial scalar	100.44	−.002	−.001	.001	23

Fear of COVID-19 descriptive statistics

	Fear of COVID			Anxiety			Stress			Correlations		
	M	*SD*	α	*M*	*SD*	α	*M*	*SD*	α	r_{f-a}	r_{f-s}	r_{a-s}
Primary	4.08	1.62	.91	2.82	0.68	.68	2.96	0.60	.08	—	.30**	—
Lower secondary	3.39	1.68	.93	2.78	0.76	.84	2.85	0.77	.68	.31**	.35**	.59**
Upper secondary	3.13	1.55	.92	2.81	0.72	.84	2.86	0.71	.67	.26**	.33**	.58**
Bachelor	3.05	1.36	.90	2.84	0.69	.85	2.81	0.70	.72	.28**	.34**	.57**
Master	2.84	1.24	.89	2.79	0.67	.86	2.70	0.69	.72	.33**	.39**	.58**
PhD	2.80	1.26	.90	2.66	0.67	.86	2.59	0.68	.72	.38**	.43**	.55**

Note. $N = 14,557$; covariances estimated freely: 3 + 6, 3 + 7, 6 + 7, 1 + 2, 1 + 4, 2 + 5; $df = 8$. χ^2 difference tests were both significant, $p < .001$. We calculated correlation coefficients based on latent factor scores estimated with MGCFA. r_{f-a} = correlation between the FCV-19S and STAI-6, r_{f-s} = correlation between the FCV-19S and PSS-4, r_{a-s} = correlation between STAI-6 and PSS-4. COVID-19 = coronavirus disease; MGCFA = multigroup confirmatory factor analysis; FCV-19s = Fear of COVID-19 Scale; STAI-6 = State-Trait Anxiety Inventory 6; PSS-6 = Perceived Stress Scale 4; CFI = Comparative fit index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual.
** $p < .01$.

modification indices, which might be somewhat controversial (Sellbom & Tellegen, 2019), possibly impairing its replicability. Given the exploratory character of our strategy, we interpretated those correlations (i.e., psychological and physiological aspects of fear) in a post-hoc manner. We obtained equivocal support for cross-cultural comparisons in levels of fear of COVID-19, and this heterogeneity was further visible in invariance tests. Items measuring psychological aspects of fear of COVID-19 were noninvariant more often than those measuring the physiological aspects of such fear. Further, their distribution differed, indicating that physiological aspects of fear were less pronounced. Therefore, follow-up research could examine independently psychological from physiological aspects of fear of COVID-19 (Mertens et al., 2021). Regardless, more conclusive evidence about an underlying factor structure is only obtainable with longitudinal data, as cross-sectional data can obscure it (Vander Weele & Batty, 2020).

Concluding Remarks

How did the FCV-19S (Ahorsu et al., 2020) fare? We examined the scale in 48 countries and found that it is unifactorial. However, we also found that the scale is in need of measurement modifications, which currently limit its utility. Factor analyses indicated that the scale assesses two aspects of fear of COVID-19, psychological and physiological, but the issue needs more thorough investigation. Although the scale is suitable for cross-cultural research, it is limited when it comes to examining correlates and predictors of fear of COVID-19 (as indicated by metric levels of invariance). We suggest that the FCV-19S might be cautiously used in studies focused on cross-cultural comparisons of level of fear of COVID-19 (as per the findings on alignment optimization). However, given the number of adjustments needed in the model, we recommend the latent variable approach, relying on latent scores. Finally, we suggest that the scale be used on comparing level of fear of COVID-19 between genders and educational groups (as per the finding on scalar-level of invariance).

References

Adams, R. J. (2010). Improving health outcomes with better patient understanding and education. *Risk Management and Healthcare Policy*, *3*, 61–72. https://doi.org/10.2147/RMHP.S7500

Ahmed, M. Z., Ahmed, O., Aibao, Z., Hanbin, S., Siyu, L., & Ahmad, A. (2020). Epidemic of COVID-19 in China and associated psychological problems. *Asian Journal of Psychiatry*, *51*, Article 102092. https://doi.org/10.1016/j.ajp.2020.102092

Ahorsu, D. K., Lin, C. Y., Imani, V., Saffari, M., Griffiths, M. D., & Pakpour, A. H. (2020). The fear of COVID-19 scale: Development and initial validation. *International Journal of Mental Health and Addiction*, *1*(1), Article 43. https://doi.org/10.1007/s11469-020-00270-8

Ali, M., Uddin, Z., Banik, P. C., Hegazy, F. A., Zaman, S., Ambia, A. S. M., Siddique, M. K. B., Islam, R., Khanam, F., Bahalul, S. M., Sharker, M. A., Hossain, F. M. A., & Ahsan, G. U. (2021). Knowledge, attitude, practice and fear of COVID-19: A cross-cultural study. *International Journal of Mental Health and Addiction*, *23*(2), 1–16. https://doi.org/10.1007/s11469-021-00638-4

Alyami, M., Henning, M., Krägeloh, C. U., & Alyami, H. (2020). Psychometric Evaluation of the Arabic Version of the Fear of COVID-19 Scale. *International Journal of Mental Health and Addiction*, *27*, 1–14. https://doi.org/10.1007/s11469-020-00316-x

Barrios, I., Ríos-González, C., O'Higgins, M., González-Urbieta, I., García, O., Almirón-Santacruz, J., Navarro, R., Melgarejo, O., Ruiz Díaz, N., Castaldelli-Maia, J. M., Ventriglio, A., & Torales, J. (2021). Psychometric properties of the Spanish version of the Fear of COVID-19 scale in Paraguayan population. *Irish Journal of Psychological Medicine*, *49*, 1–6. https://doi.org/10.1017/ipm.2021.5

Bitan, D. T., Grossman-Giron, A., Bloch, Y., Mayer, Y., Shiffman, N., & Mendlovic, S. (2020). Fear of COVID-19 scale: Psychometric characteristics, reliability and validity in the Israeli population. *Psychiatry Research*, *289*, Article 113100. https://doi.org/10.1016/j.psychres.2020.113100

Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of Cross-Cultural Psychology*, *1*(3), 185–216. https://doi.org/10.1177/135910457000100301

Brown, T. A. (2015). *Confirmatory factor analysis for applied research*. Guilford Press.

Cavalheiro, F. R. S., & Sticca, M. G. (2020). Adaptation and validation of the Brazilian version of the fear of COVID-19 scale. *International Journal of Mental Health and Addiction*, *55*(11), 1–9. https://doi.org/10.1007/s11469-020-00415-9

Caycho-Rodríguez, T., Tomás, J. M., Barboza-Palomino, M., Ventura-León, J., Gallegos, M., Reyes-Bossio, M., & Vilca, L. W. (2021). Assessment of fear of COVID-19 in older adults: Validation of the Fear of COVID-19 Scale. *International Journal of Mental Health and Addiction*, *70*, 1–15. https://doi.org/10.1007/s11469-020-00438-2

Caycho-Rodríguez, T., Valencia, P. D., Vilca, L. W., Cervigni, M., Gallegos, M., Martino, P., Barés, I., Calandra, M., Rey Anacona César, A., López-Calle, C., Moreta-Herrera, R., Chacón-Andrade, E. R., Lobos-Rivera, M., del Carpio, P., Quintero, Y., Robles, E., Panza Lombardo, M., Gamarra Recalde, O., Buschiazzo Figares, A., . . . Burgos Videla, C. (2021). Cross-cultural measurement invariance of the fear of COVID-19 scale in seven Latin American countries. *Death Studies*, 1–15. https://doi.org/10.1080/07481187.2021.1879318

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling*, *14*(3), 464–504. https://doi.org/10.1080/10705510701301834

Cieciuch, J., Davidov, E., Schmidt, P., & Algesheimer, R. (2019). How to obtain comparable measures for cross-national comparisons. *KZfSS Kölner Zeitschrift für Soziologie und Sozialpsychologie* [The Cologne Journal of Sociology and Social Psychology], *71*(1), 157–186. https://doi.org/10.1007/s11577-019-00598-7

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*(4), 385–396. https://doi.org/10.2307/2136404

Counted, V., Pargament, K. I., Bachera, A. O., Joynt, S., & Cowden, R. G. (2020). Hope and well-being in vulnerable contexts during the COVID-19 pandemic: Does religious coping matter? *The Journal of Positive Psychology*, *15*, 1–12. https://doi.org/10.1080/17439760.2020.1832247

Enea, V., Eisenbeck, N., Petrescu, T. C., & Carreno, D. F. (2021). Perceived impact of quarantine on loneliness, death obsession, and preoccupation with God: Predictors of increased fear of COVID-19. *Frontiers in Psychology*, *12*, Article 643977. https://doi.org/10.3389/fpsyg.2021.643977

Fitzpatrick, K. M., Harris, C., & Drawve, G. (2020). Fear of COVID-19 and the mental health consequences in America. *Psychological Trauma: Theory, Research, Practice, and Policy*, *12*(S1), S17–S21. https://doi.org/10.1037/tra0000924

Fofana, N. K., Latif, F., Sarfraz, S., Bilal, Bashir, M. F., & Komal, B. (2020). Fear and agony of the pandemic leading to stress and mental illness: An emerging crisis in the novel coronavirus (COVID-19) outbreak. *Psychiatry Research*, *291*, Article 113230. https://doi.org/10.1016/j.psychres.2020.113230

Fu, S. Q., Greco, L. M., Lennard, A. C., & Dimotakis, N. (2021). Anxiety responses to the unfolding COVID-19 crisis: Patterns of change in the experience of prolonged exposure to stressors. *Journal of Applied Psychology*, *106*(1), 48–61. https://doi.org/10.1037/apl0000855

Gao, J., Zheng, P., Jia, Y., Chen, H., Mao, Y., Chen, S., Mao, Y., Chen, S., Wang, Y., Fu, H., Dai, J., & Hashimoto, K., (2020). Mental health problems and social media exposure during COVID-19 outbreak. *PLOS ONE*, *15*(4), Article e0231924. https://doi.org/10.1371/journal.pone.0231924

Govender, K., Cowden, R. G., Nyamaruze, P., Armstrong, R. M., & Hatane, L. (2020). Beyond the disease: Contextualized implications of the COVID-19 pandemic for children and young people living in Eastern and Southern Africa. *Frontiers in Public Health*, *8*, Article 504. https://doi.org/10.3389/fpubh.2020.00504

Gross, J. J., & Jazaieri, H. (2014). Emotion, emotion regulation, and psychopathology: An affective science perspective. *Clinical Psychological Science*, *2*(4), 387–401. https://doi.org/10.1177/2167702614536164

He, J., Van de Vijver, F. J., Fetvadjiev, V. H., de Carmen Dominguez Espinosa, A., Adams, B., Alonso–Arbiol, I., Aydinli–Karakulak, A., Buzea, C., Dimitrova, R., Fortin, A., Hapunda, G., Ma, S., Sargautyte, R., Sim, S., Schachner, M. K., Suryani, A., Zeinoun, P., & Zhang, R., (2017). On enhancing the cross–cultural comparability of Likert–scale personality and value measures: A comparison of common procedures. *European Journal of Personality*, *31*(6), 642–657. https://doi.org/10.1002/per.2132

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Hu, J., He, W., & Zhou, K. (2020). The mind, the heart, and the leader in times of crisis: How and when COVID-19-triggered mortality salience relates to state anxiety, job engagement, and prosocial behavior. *Journal of Applied Psychology*, *105*(11), 1218–1233. https://doi.org/10.1037/apl0000620

Huarcaya-Victoria, J., Villarreal-Zegarra, D., Podestà, A., & Luna-Cuadros, M. A. (2020). Psychometric properties of a Spanish version of the Fear of COVID-19 Scale in general population of Lima, Peru. *International Journal of Mental Health and Addiction*, *103*, 1–14. https://doi.org/10.1007/s11469-020-00354-5

Iversen, A. C., & Kraft, P. (2006). Does socio-economic status and health consciousness influence how women respond to health related messages in media? *Health Education Research*, *21*(5), 601–610. https://doi.org/10.1093/her/cyl014

Iversen, M. M., Norekvål, T. M., Oterhals, K., Fadnes, L. T., Mæland, S., Pakpour, A. H., & Breivik, K. (2021). Psychometric properties of the Norwegian version of the Fear of COVID-19 Scale. *International Journal of Mental Health and Addiction*, *16*, 1–19. https://doi.org/10.1007/s11469-020-00454-2

Kenny, D. A., Kaniskan, B., & McCoach, D. B. (2015). The performance of RMSEA in models with small degrees of freedom. *Sociological Methods & Research*, *44*(3), 486–507. https://doi.org/10.1177/0049124114543236

Lazarus, R. S. (2006). *Stress and emotion: A new synthesis*. Springer Publishing Company.

Lei, L., Huang, X., Zhang, S., Yang, J., Yang, L., & Xu, M. (2020). Comparison of prevalence and associated factors of anxiety and depression among people affected by versus people unaffected by quarantine during the COVID-19 epidemic in southwestern China. *Medical Science Monitor: International Medical Journal of Experimental and Clinical Research*, *26*, e924609-1–e924609-12. https://doi.org/10.12659/MSM.924609

Leung, D. Y., Lam, T. H., & Chan, S. S. (2010). Three versions of Perceived Stress Scale: Validation in a sample of Chinese cardiac patients who smoke. *BMC Public Health*, *10*(1), Article 513. https://doi.org/10.1186/1471-2458-10-513

Lin, C.-Y., Hou, W. L., Mamun, M. A., Aparecido da Silva, J., Broche-Pérez, Y., Ullah, I., Masuyama, A., Wakashima, K., Mailliez, M., Carre, A., Chen, Y.-P., Chang, K.-C., Kuo, Y.-J., Soraci, P., Scarf, D., Broström, A., Griffiths, M. D., & Pakpour, A. H. (2021). Fear of COVID-19 Scale (FCV-19S) across countries: Measurement invariance issues. *Nursing Open*, *8*, 1892–1908. https://doi.org/10.1002/nop2.855

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, *1*(2), 130–149. https://doi.org/10.1037/1082-989X.1.2.130

Mailliez, M., Griffiths, M. D., & Carre, A. (2021). Validation of the French version of the Fear of COVID-19 Scale and its associations with depression, anxiety and differential emotions. *International Journal of Mental Health and Addiction*, *16*, 1–15. https://doi.org/10.1007/s11469-021-00499-x

Marteau, T. M., & Bekker, H. (1992). The development of a six-item short-form of the state scale of the Spielberger State-Trait Anxiety Inventory (STAI). *British Journal of Clinical Psychology*, *31*(3), 301–306. https://doi.org/10.1111/j.2044-8260.1992.tb00997.x

Masuyama, A., Shinkawa, H., & Kubo, T. (2020). Validation and psychometric properties of the Japanese version of the Fear of COVID-19 Scale among adolescents. *International Journal of Mental Health and Addiction*, 1–11. https://doi.org/10.1007/s11469-020-00368-z

Mazza, C., Ricci, E., Biondi, S., Colasanti, M., Ferracuti, S., Napoli, C., & Roma, P. (2020). A nationwide survey of psychological distress among Italian people during the COVID-19 pandemic: Immediate psychological responses and associated factors. *International Journal of Environmental Research and Public Health*, *17*(9), Article 3165. https://doi.org/10.3390/ijerph17093165

Meade, A. W., Johnson, E. C., & Braddy, P. W. (2008). Power and sensitivity of alternative fit indices in tests of measurement invariance. *Journal of Applied Psychology*, *93*(3), 568–592. https://doi.org/10.1037/0021-9010.93.3.568

Mertens, G., Duijndam, S., Smeets, T., & Lodder, P. (2021). The latent and item structure of COVID-19 fear: A comparison of four COVID-19 fear questionnaires using SEM and network analyses. *Journal of Anxiety Disorders*, *81*, Article 102415. https://doi.org/10.1016/j.janxdis.2021.102415

Midorikawa, H., Aiba, M., Lebowitz, A., Taguchi, T., Shiratori, Y., Ogawa, T., Takahashi, A., Takahashi, S., Nemoto, K., Arai, T., Tachikawa, H., Lin, C. Y., & Tachikawa, H. (2021). Confirming validity of The Fear of COVID-19 Scale in Japanese with a nationwide large-scale sample. *PLoS One*, *16*(2), Article e0246840. https://doi.org/10.1371/journal.pone.0246840

Milfont, T. L., & Fischer, R. (2010). Testing measurement invariance across groups: Applications in cross-cultural research. *International Journal of Psychological Research*, *3*(1), 111–130. https://doi.org/10.21500/20112084.857

Muthén, B., & Asparouhov, T. (2013). BSEM measurement invariance analysis. *Mplus Web Notes*, *17*, 1–48. https://www.statmodel.com/examples/webnotes/webnote17.pdf

Muthén, L. K., & Muthén, B. O. (1998–2014). *Mplus user's guide*.

Niedzwiedz, C. L., O'Donnell, C. A., Jani, B. D., Demou, E., Ho, F. K., Celis-Morales, C., Nicholl, B. I., Mair, F. S., Welsh, P., Sattar, N., Pell, J. P., & Katikireddi, S. V. (2020). Ethnic and socioeconomic differences in SARS-CoV-2 infection: Prospective cohort study using UK Biobank. *BMC Medicine*, *18*(1), Article 160. https://doi.org/10.1186/s12916-020-01640-8

Olagoke, A. A., Olagoke, O. O., & Hughes, A. M. (2020). Exposure to coronavirus news on mainstream media: The role of risk perceptions and depression. *British Journal of Health Psychology*, *25*, 865–874, Article e12427. https://doi.org/10.1111/bjhp.12427

Oliver, A., & Mossialos, E. (2004). Equity of access to health care: Outlining the foundations for action. *Journal of Epidemiology and Community Health*, *58*(8), 655–658. https://doi.org/10.1136/jech.2003.017731

Oshio, A. (2010). Culture and well-being. In E. Diener, J. E. Helliwell, & D. Kahneman (Eds.), *International differences in well-being* (pp. 34–69). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199732739.003.0003

Pfefferbaum, B., & North, C. S. (2020). Mental health and the COVID-19 pandemic. *New England Journal of Medicine*, *383*, 510–512. https://doi.org/10.1056/NEJMp2008017

Piqueras, J. A., Gomez-Gomez, M., Marzo, J. C., Gomez-Mir, P., Falco, R., & Valenzuela, B., & the PSICORECUR-SOS COVID-19 study group. (2021). Validation of the Spanish version of Fear of COVID-19 Scale: Its association with acute stress and coping. *International Journal of Mental Health and Addiction*, *27*, 1–18. https://doi.org/10.1007/s11469-021-00615-x

Ramikie, T. S., & Ressler, K. J. (2018). Mechanisms of sex differences in fear and posttraumatic stress disorder. *Biological Psychiatry*, *83*(10), 876–885. https://doi.org/10.1016/j.biopsych.2017.11.016

Reznik, A., Gritsenko, V., Konstantinov, V., Khamenka, N., & Isralowitz, R. (2020). COVID-19 Fear in Eastern Europe: Validation of the Fear of COVID-19 Scale. *International Journal of Mental Health and Addiction*, *19*, 1–6. https://doi.org/10.1007/s11469-020-00283-3

Rhemtulla, M., Brosseau-Liard, P. É., & Savalei, V. (2012). When can categorical variables be treated as continuous? A comparison of robust continuous and categorical SEM estimation methods under suboptimal conditions. *Psychological Methods*, *17*(3), 354–373. https://doi.org/10.1037/a0029315

Rutkowski, L., & Svetina, D. (2004). Assessing the hypothesis of measurement invariance in the context of large-scale international surveys. *Educational and Psychological Measurement*, *74*, 31–57. https://doi.org/10.1177/0013164413498257

Sakib, N., Bhuiyan, A. K. M. I., Hossain, S., Al Mamun, F., Hosen, I., Abdullah, A. H., Sarker, M. A., Mohiuddin, M. S., Rayhan, I., Hossain, M., Sikder, M. T., Gozal, D., Muhit, M., Islam, S. M. S., Griffiths, M. D., Pakpour, A. H., & Mamun, M. A. (2020). Psychometric validation of the Bangla Fear of COVID-19 Scale: Confirmatory factor analysis and Rasch analysis. *International Journal of Mental Health and Addiction*, *25*, 1–12. https://doi.org/10.1007/s11469-020-00289-x

Satici, B., Gocet-Tekin, E., Deniz, M. E., & Satici, S. A. (2020). Adaptation of the Fear of COVID-19 Scale: Its association with psychological distress and life satisfaction in Turkey. *International Journal of Mental Health and Addiction*, *48*, 1–9. https://doi.org/10.1007/s11469-020-00294-0

Sellbom, M., & Tellegen, A. (2019). Factor analysis in psychological assessment research: Common pitfalls and recommendations. *Psychological Assessment*, *31*(12), 1428–1441. https://doi.org/10.1037/pas0000623

Stevens, J. S., & Hamann, S. (2012). Sex differences in brain activation to emotional stimuli: A meta-analysis of neuroimaging studies. *Neuropsychologia*, *50*(7), 1578–1593. https://doi.org/10.1016/j.neuropsychologia.2012.03.011

Tluczek, A., Henriques, J. B., & Brown, R. L. (2009). Support for the reliability and validity of a six-item state anxiety scale derived from the State-Trait Anxiety Inventory. *Journal of Nursing Measurement*, *17*(1), 19–28. https://doi.org/10.1891/1061-3749.17.1.19

Torales, J., O'Higgins, M., Castaldelli-Maia, J. M., & Ventriglio, A. (2020). The outbreak of COVID-19 coronavirus and its impact on global mental health. *The International Journal of Social Psychiatry*, *66*(4), 317–320. https://doi.org/10.1177/0020764020915212

Trougakos, J. P., Chawla, N., & McCarthy, J. M. (2020). Working in a pandemic: Exploring the impact of COVID-19 health anxiety on work, family, and health outcomes. *Journal of Applied Psychology*, *105*(11), 1234–1245. https://doi.org/10.1037/apl0000739

Tsipropoulou, V., Nikopoulou, V. A., Holeva, V., Nasika, Z., Diakogiannis, I., Sakka, S., Kostikidou, S., Varvara, C., Spyridopoulou, E., & Parlapani, E. (2020). Psychometric Properties of the Greek Version of FCV-19S. *International Journal of Mental Health and Addiction*, *9*, 1–10. https://doi.org/10.1007/s11469-020-00319-8

Vallejo, M. A., Vallejo-Slocker, L., Fernández-Abascal, E. G., & Mañanes, G. (2018). Determining factors for stress perception assessed with the Perceived Stress Scale (PSS-4) in Spanish and other European samples. *Frontiers in Psychology*, *9*, Article 37. https://doi.org/10.3389/fpsyg.2018.00037

Vander Weele, T. J., & Batty, C. J. (2020). *On the dimensional indeterminacy of one-wave factor analysis under causal effects* [preprint]. arXiv:2001.10352.

Vatcheva, K. P., Lee, M., McCormick, J. B., & Rahbar, M. H. (2016). Multicollinearity in regression analyses conducted in epidemiologic studies. *Epidemiology*, *6*(2), Article 227. https://doi.org/10.4172/2161-1165.1000227

Wakashima, K., Asai, K., Kobayashi, D., Koiwa, K., Kamoshida, S., & Sakuraba, M. (2020). The Japanese version of the Fear of COVID-19 scale: Reliability, validity, and relation to coping behavior. *PLOS ONE*, *15*(11), Article e0241958. https://doi.org/10.1371/journal.pone.0241958

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health*, *17*(5), Article 1729. https://doi.org/10.3390/ijerph17051729

World Health Organization. (2021). *WHO coronavirus disease (COVID-19) dashboard*. Retrieved February 26, 2021, from https://covid19.who.int/?gclid=CjwKCAiAv4n9BRA9EiwA30WND9FhCIrWc2SWZG-fZrUMN-cY-2yyYc9lyWc3tyMq1Q2d--Bioxy4iRoCrP0QAvD_BwE

Xiong, J., Lipsitz, O., Nasri, F., Lui, L. M. W., Gill, H., Phan, L., Chen-Li, D., Iacobucci, M., Ho, R., Majeed, A., & McIntyre, R. S. (2020). Impact of COVID-19 pandemic on mental health in the general population: A systematic review. *Journal of Affective Disorders*, *277*, 55–64. https://doi.org/10.1016/j.jad.2020.08.001

Yuan, K. H., & Bentler, P. M. (2000). 5. Three likelihood-based methods for mean and covariance structure analysis with nonnormal missing data. *Sociological Methodology*, *30*(1), 165–200. https://doi.org/10.1111/0081-1750.00078

Zhou, X., Sedikides, C., Mo, T., Li, W., Hong, E., & Wildschut, T. (2021). The restorative power of nostalgia: Thwarting loneliness by raising happiness during the COVID-19 pandemic. *Social Psychological and Personality Science*. https://doi.org/10.1177/19485506211041830

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