ORIGINAL ARTICLE

Validation of the Fear of COVID-19 Scale in a US College Sample

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Abstract

The COVID-19 pandemic has impacted college students' coursework, stress levels, and perceived health. Various estimates indicate that high proportions of college students have experienced increased amounts of stress (Dziech, *Inside Higher Education*, 2020; Hartocollis, *New York Times*, 2020), yet other sources indicate that many college students respond to these changes with resilience (Kelley, *Cornell Chronicle*, 2020). A method for assessing student anxiety regarding the pandemic is thus needed. The Fear of COVID-19 Scale (FCV-19S) (Ahorsu et al., *International Journal of Mental Health and Addiction*, 2020) is a seven-item scale which has been validated and shown to possess good psychometric qualities in studies of participants from multiple countries. The current study used a cross-sectional convenience sample of US college student participants ($n = 237$) and found that the FCV-19S has high reliability and validity as demonstrated by its internal consistency and strong one-factor solution. Scores on the FCV-19S were positively correlated with anxiety for students who were married or of Asian descent. Additionally, the FCV-19S was only moderately correlated with the Generalized Anxiety Disorder-7 Scale (GAD-7), suggesting that the FCV-19S may bring added utility to research and clinical practice with populations impacted by the COVID-19 pandemic.

COVID-19 was declared a pandemic by the World Health Organization on March 11, 2020 (World Health Organization 2020). Confirmed US cases of COVID-19 were identified in January 2020 (Centers for Disease Control and Prevention 2020) and by mid-March the first statewide shelter-in-place order was announced in California (California Exec Order No. N-33-20 2020). Since that time, various shelter-in-place orders have been declared at the state, county, and local levels, and in time have been altered or revoked according to various timelines

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and rules. Sources of information about the pandemic have often been confusing and conflicting.

Among the resulting pandemic-related changes were shutdowns of many universities. Resident students were moved off campus in some cases to reduce the chance of transmission in dense dormitory settings. Face-to-face classes were changed to an all-online format for remote teaching to avoid meeting in person. Many students were negatively affected by work and financial losses. For some, health care and mental health care were reduced or unavailable due to the shutdown of student health centers. Overall, student life became more unpredictable and stressful (DePaul University Graduate Student Pandemic Graduate Student Association 2020; Dziech 2020; Hartocollis 2020). One survey found 91% of US college students reported increased stress or anxiety (Active Minds 2020). Anecdotal reports from students point to their difficulties adjusting to the ambiguities of the unprecedented open-ended crisis of the COVID-19 pandemic.

At the same time, not all students reported distress. Some students responded to the present crisis with resilience (Kelley 2020). A recent study on the impact of the pandemic on Chinese medical students (Cao et al. 2020) found increased but not uniformly disordered distress. It showed 24% of students experienced mild or moderate anxiety based on the Generalized Anxiety Disorder-7 item scale. Thus, a way to accurately assess each student's level of distress due to the current pandemic is needed.

A crisis in mental health due to the COVID-19 pandemic is likely approaching (Horesh and Brown 2020; Qiu et al. 2020, Rajkumar 2020; Xiang et al. 2020; Pakpour and Griffiths 2020; Lin 2020) for wide segments of the populations of many countries. It is likely that interventions at both the individual and societal level will be warranted. It is not clear whether traditional models of anxiety and its treatment will suffice in this case, because the provoking event is not only pervasive throughout the world, but unknown in recent history. The pandemic has come with ambiguous, incomplete, changing, or confusing information. The incomplete nature of our understanding of the phenomenon of COVID-19-related distress means more information is needed before intervention development begins (Rajkumar 2020). A first step is to evaluate the measurement of psychological distress associated with the COVID-19 pandemic. In particular, fear and anxiety regarding COVID-19 need to be evaluated for potential utility in research and clinical practice.

The Fear of COVID-19 Scale (FCV-19S) was developed (Ahorsu et al. 2020) to assess specific anxieties regarding COVID-19. The FCV-19S is a seven-item questionnaire developed using both classical test theory and Rasch analysis. An Iranian sample was used to validate the initial Farsi-language scale, and it was found to have strong psychometric qualities, including good internal consistency reliability. Construct validity was supported, as scores on the FCV-19S were found to correlate with other measures of health-related anxiety, depression, and perceived vulnerability to disease. Overall, the FCV-19S showed strong psychometric qualities (Pakpour et al. 2020).

The FCV-19 Scale was translated into English for its initial publication and was soon translated into several other languages. Its psychometric qualities were explored with samples from Italy (Soraci et al. 2020), Turkey (Satici et al. 2020), Bangladesh (Sakib et al. 2020), Eastern Europe (Reznik et al. 2020), and Saudi Arabia (Alyami et al. 2020). Psychometric properties were generally strong in each sample. Specifically, in each study, internal consistency reliability of the measure was supported by Cronbach's alphas at or above 0.80. In these studies, construct validity was supported by associations between the FCV-19S and higher scores on measures of anxiety, worry, depression, and perceived vulnerability to disease. A strong one-factor solution was found for the scale in studies based in Italy (Soraci et al. 2020), Turkey (Satici et al. 2020), Bangladesh (Sakib et al. 2020), and

Saudi Arabia (Alyami et al. 2020). In an Eastern European sample, however, Reznik et al. (2020) found a factor solution that was distinct from these clear one-factor solutions.

The essential purpose of this study was to examine the psychometric qualities of the FCV-19S in a sample of English-speaking US college students. We also wanted to explore construct validity further by examining the relationship between the FCV-19S and the GAD-7, a measure of generalized anxiety.

Methods

Participants

Participants were $n = 237$ undergraduate and graduate students at a small public university. Eligible participants were university students taking at least one graduate or undergraduate class. Students were recruited through announcements in online classes. (All university courses were online during this period due to the COVID-9 pandemic.)

Measures

Demographic Questionnaire

Students completed a demographic questionnaire including gender, ethnicity, age, and several other demographic factors.

Generalized Anxiety Disorder Seven-Item Scale

The Generalized Anxiety Disorder-7 (GAD-7) scale (Spitzer et al. 2006; Toussaint et al. 2020) is a seven-item scale developed for use in screening, diagnosis, and severity assessment for anxiety disorders which has strong psychometric qualities. It is a widely used measure in both research and clinical settings and has been used to evaluate students during the COVID-19 pandemic in at least one research project (Cao et al. 2020). In the present study, we found that the GAD-7 had excellent internal consistency reliability ($\alpha = 0.93$).

Fear of COVID-19 Scale

The FCV-19S (Ahorsu et al. 2020) is a seven-item scale assessing anxiety regarding COVID-19. Items are endorsed on a 5-item Likert scale from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). Total scores range from 7 to 35.We used the English translation of the FCV-19S included in the original authors' work (Ahorsu et al. 2020) and changed several words to avoid confusion which might have resulted when using the items with this population of students. Item 1 (see Table 2 for a list of items) initially read, "I am most afraid of Coronavirus-19." "Most afraid" could be interpreted in this population as an absolute ranking of fears rather than noting strong fear, so we changed the wording to "Very afraid." Item 7 was originally, "I am afraid of losing my life because of coronavirus-19. "Losing my life" was changed to "dying" because the former is a less commonly used expression in American English. We believed these changes prevented error which could have come through participant misinterpretation. The FCS-19S scale used was otherwise identical to the Ahorsu et al. (2020) wording.

Procedure

This study was approved by the University Committee for the Protection of Human Subjects. The procedures used in this study adhere to the tenets of the Declaration of Helsinki. Participants provided informed consent to participate. Students were recruited through an announcement provided by their instructor in online university classes from various subject areas. Students responded to the survey through Qualtrics. The median time to complete the survey was 7 min, 30 s. Block randomization of survey instruments was used to prevent order effects.

Statistical Analysis

Descriptive statistics were used to examine the demographic characteristics of participants in the sample. Internal consistency reliability of the Fear of COVID-19 Scale was measured with SPSS Version 26 using Cronbach's alpha, inter-item correlations, and corrected item-total correlations. As recommended by Clark and Watson (1995) and Field (2009), a Cronbach's alpha of 0.80 or higher, minimum inter-item correlations between 0.15 and 0.50, and minimum corrected item-total correlations of 0.30 were used as indicators of internal consistency reliability. Given that the present study was to our knowledge the first to use the English-language version of the Fear of COVID-19 Scale in a sample of US college students, we conducted an exploratory factor analysis (EFA) of the scale using SPSS Version 26. Additionally, we believed an EFA was more appropriate than a confirmatory factor analysis (CFA) because previous studies had not all found the same, one-factor solution across samples from different nations and languages. Furthermore, this is the recommended approach when conducting the first psychometric evaluation of a newly translated measure, regardless of the rigor of the translation method (Swami and Barron 2019). Given the conceptual similarity among items, we assumed that if there were multiple factors, they would be correlated. Thus, we conducted a principal axis factor analysis with a direct oblimin rotation. Based on recommendations by Clark and Watson (1995), we considered our sample size sufficiently large to conduct an EFA on the seven-item Fear of COVID-19 Scale. As recommended by Field (2009), we used a cutoff of the Kaiser-Meyer-Olkin (KMO) measure of ≥ 0.8 as empirical evidence of a sufficiently large sample size for factor analysis. Following the EFA, a simultaneous, multiple regression analysis was conducted to predict Fear of COVID-19 total scores from theoretically important predictors. A simultaneous multiple regression was chosen because of the limited amount of prior research on predictors of Fear of COVID-19 total scores to guide the ordering of predictors in a stepwise multiple regression.

Results

Participant Characteristics

As indicated in Table 1, the 237 participants in the current sample were older than traditional college students ($M = 30.3$; $SD = 10.2$), which is reflective of the broader university from which the sample was drawn. Most participants were female (73%), single (59%), undergraduate students (89%), and most reported experiencing a negative financial impact by the COVID-19 response (73%). Similar to the broader university, participants in the sample were

Table 1 Demographic and anxiety characteristics of students in study

M (SD) or percentage of sample[a] (n = 237)	
Age (years)	30.3(10.2)
18–25	45%
26–60	55
Gender	
Female	73%
Male	27
Marital status	
Single	59%
Married/partnered	36
Separated/divorced	6
Ethnicity	
Hispanic	30%
Caucasian	30
African-American	17
Asian	9
None of the above[b]	8
Biracial	7
Student type	
Undergraduate	89%
Graduate	11
Negative financial impact by COVID-19 response[c]	73%
Know someone with COVID-19 symptoms[d]	29%
GAD-7 total	7.1(6.0)
Minimal (0–4)	42%
Mild (5–9)	25
Moderate (10–14)	19
Severe (15 or higher)	14
Fear of COVID-19 total	18.1(7.1)

[a] Note that percentages are based on the number responding to each question and may not add up to 100% due to rounding

[b] Participants who did not fit any of the four categories chose "none of the above"

[c] Response to item, "Has the COVID-19 pandemic or response to it negatively impacted you financially?"

[d] Response to item, "Do you know anyone who has had symptoms of COVID-19?"

ethnically diverse, as most participants identified as Caucasian (30%), Hispanic (30%), African-American (17%), or Asian (9%). Most participants (58%) reported at least mild anxiety in the past 2 weeks on an anxiety screener (GAD-7).

Internal Consistency Reliability of the Fear of COVID-19 Scale

As indicated in Table 2, the Cronbach's alpha for the 7-item Fear of COVID-19 Scale was excellent, with an overall $\alpha = 0.91$. Further evidence of the reliability of the scale was found in the very high corrected item-total correlations of all seven items in the scale (all $rs \geq 0.70$). Also, as seen in Table 2, there were moderate inter-item correlations among the seven items of the scale, which ranged from $r = 0.52$ to $r = 0.72$. Taken together, these three indicators are all above the recommend cutoffs suggested by Clark and Watson (1995) and Field (2009) and suggest that the Fear of COVID-19 Scale demonstrates excellent internal consistency reliability.

Table 2 Exploratory factor analysis and measures of internal consistency reliability of English language Fear of COVID-19 Scale

Item	Factor loading	Corrected item-total correlation	Cronbach's alpha	Inter-item correlation range	M(SD)	Skewness	Kurtosis
1. I am very afraid of coronavirus-19.	0.72	0.72		0.52–0.68	3.2(1.2)	− 0.29	− 0.94
2. It makes me uncomfortable to think about coronavirus-19.	0.81	0.77		0.54–0.72	3.0(1.3)	− 0.06	− 1.3
3. My hands become clammy when I think about coronavirus-19.	0.70	0.72		0.53–0.65	1.9(1.1)	1.1	0.37
4. I am afraid of dying because of coronavirus-19.	0.77	0.70		0.53–0.62	2.7(1.4)	0.24	− 1.3
5. When watching news and stories about coronavirus-19 on social media, I become nervous or anxious.	0.83	0.76		0.57–0.72	3.1(1.4)	− 0.13	− 1.3
6. I cannot sleep because I'm worrying about getting coronavirus-19.	0.75	0.72		0.52–0.71	2.0(1.1)	0.95	0.08
7. My heart races or palpitates when I think about getting coronavirus-19.	0.85	0.76		0.54–0.71	2.3(1.3)	0.82	− 0.42
Overall			.91				

Exploratory Factor Analysis

We obtained a KMO of 0.88, indicating a sufficiently large sample size for the EFA. The principal axis factor analysis revealed a single-factor solution, with an eigenvalue of 4.63 that explained 66% of the variance in the Fear of COVID-19 scores. As indicated in the scree plot in Fig. 1, no other factors had eigenvalues > 1.0 and there was a clear bend after the first factor on visual inspection of the scree plot. As indicated in Table 2, factor loadings were high (all loadings ≥ 0.70) and there were no cross-loadings of items on multiple factors. Taken together, the results of the EFA revealed a one-factor solution for the English language Fear of COVID-19 Scale with a US college sample.

Simultaneous Multiple Linear Regression

As indicated in Table 3, we conducted a simultaneous multiple linear regression predicting Fear of COVID-19 total scores from demographic characteristics (i.e., age, gender, ethnicity, marital status), mental health characteristics (i.e., GAD-7), and COVID-19 specific character-istics (i.e., knowing someone with COVID-19 symptoms; experiencing negative financial impact due to COVID-19). Categorical variables were dummy coded with the most frequent
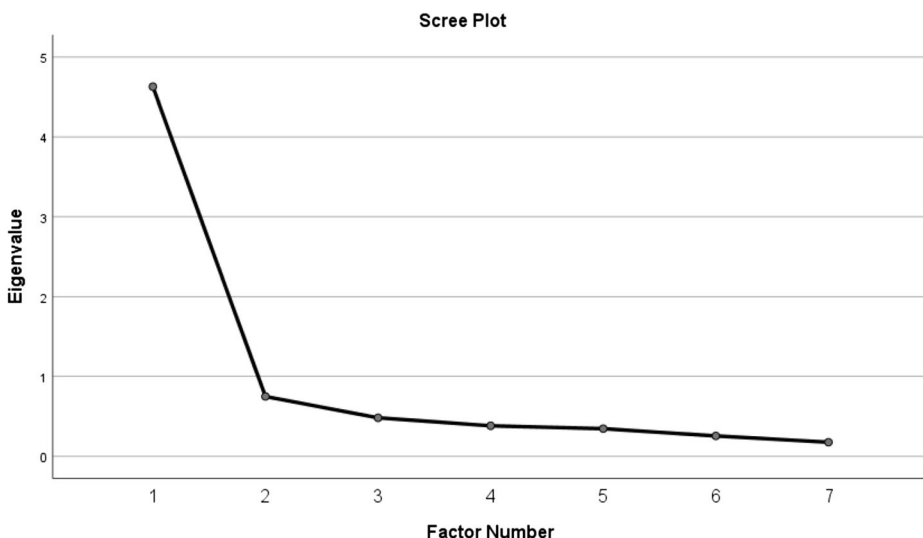
Fig. 1 Scree plot of exploratory factor analysis of English language Fear of COVID-19 Scale

category serving as the reference group. Thus, for gender, females served as the reference group; for ethnicity, Caucasians served as the reference group; and for marital status, single/never married served as the reference group. As seen in Table 3, only four predictors were significant. Regarding demographic predictors, participants of Asian descent reported significantly higher Fear of COVID-19 total scores than Caucasians ($B = 4.45$, SEB = 1.31, $\beta = 0.18$, $p = 0.001$). In addition, married or partnered participants reported significantly higher Fear of COVID-19 total scores than single participants ($B = 1.76$, SEB = 0.79, $\beta = 0.13$, $p = 0.03$). Furthermore, participants who knew someone with COVID-19 reported significantly higher Fear of COVID-19 total scores than those who did not know anyone with symptoms ($B = 2.42$, SEB = 0.79, $\beta = 0.15$, $p = 0.003$). Finally, in support of convergent validity, participants who scored higher on the GAD-7 had significantly higher Fear of COVID-19 total scores ($B = 0.75$, SEB = 0.06, $\beta = 0.64$, $p < 0.001$).

As a follow-up analysis to support the construct validity of the FCV-19S, we also calculated the zero-order correlation coefficient between the FCV-19S Total Score and the GAD-7 Total Score. We found a significant and moderate correlation between the two, $r = 0.68$, $p < 0.001$.

Discussion

The current study presented a psychometric evaluation of the Fear of COVID-19 Scale (FCV-19S) with a US college population. The results indicate that the scale has good internal consistency reliability, a finding consistent with previous research on the scale in a variety of other national samples (Ahorsu et al. 2020; Alyami et al. 2020; Reznik et al. 2020; Sakib et al. 2020; Satici et al. 2020; Soraci et al. 2020). Additionally, these results showed that the scale has a single-factor structure, adding to the previous studies which also found this structure for the scale (Ahorsu et al. 2020; Soraci et al. 2020; Satici et al. 2020; Sakib et al.

Table 3 Simultaneous multiple regression analysis predicting Fear of COVID-19 total scores

Predictor	Unstandardized B	Standard error B	Standardized β	p value
Age	−0.05	0.04	−0.07	0.21
Gender[a]	−0.93	0.81	−0.06	0.25
African-American[b]	1.69	1.05	0.09	0.11
Hispanic[b]	1.31	0.87	0.08	0.13
Asian[b]	4.45	1.31	0.18	0.001**
Biracial[b]	0.52	1.38	0.02	0.71
None of the above[b,c]	0.40	1.31	0.02	0.77
Married or partnered[d]	1.76	0.79	0.12	0.03*
Divorced or separated[d]	0.90	1.54	0.03	0.56
COVID-19 negative financial impact[e]	0.46	0.81	0.03	0.57
Know someone with COVID-19 symptoms[f]	2.42	0.79	0.15	0.003**
GAD-7[g]	0.75	0.06	0.64	<0.001**

*$p < 0.05$; **$p < 0.01$

[a] Females were the reference group

[b] Caucasian was the reference group

[c] Participants who did not fit any of the four categories chose "none of the above"

[d] Single was the reference group

[e] Response to item, "Has the COVID-19 pandemic or response to it negatively impacted you financially?" No was the reference group

[f] Response to item, "Do you know anyone who has had symptoms of COVID-19?" No was the reference group

[g] Total score for the seven-item Generalized Anxiety Disorder screener (GAD-7)

2020). Construct validity was demonstrated by the positive relationship between scores on the FCV-19S and a measure of generalized anxiety, the GAD-7.

At the same time, the relationship between the FCV-19S and the GAD-7 also illustrates divergence. While the statistical results show correlation between the two, with higher scores on the GAD-7 predicting higher scores on the FCV-19S, the absolute value of the correlation was only moderate ($r = 0.68$). This suggests that there is significant unshared variance between the two scales and that they represent more than one underlying construct. This demonstrates that the FCV-19S may contribute some unique variance to the picture of overall anxiety. Whereas the GAD-7 focuses on generic experiences of anxiety regardless of source, the FCV-19S focuses solely on COVID-19 to the point of including the term "COVID-19" in each question. It brings to the picture a more specific topic focus—COVID-19-related concerns—and distinguishes them from items measuring overall emotional or experiential anxiety. The GAD-7, by design, measures more diffuse and general anxiety about an individual's daily experience, while the FCV-19S isolates the anxiety that is solely related to the current pandemic. Although the GAD-7 asks about the past 2 weeks, it is possible that the results of the current study may be emerging from a quasi "state/trait" relationship, with GAD-7 reflecting a more enduring trait-like experience, and the FCV-19S representing a more transient, quasi-state experience due to the momentary pandemic. In future research, testing this possibility using a validated measure of trait/state anxiety could help to answer this question.

Even without being able to fully identify the nature of the non-shared variability between the GAD-7 and the FCV-19S, these results do establish the added utility of the FCV-19 Scale

in both research and clinical settings. For instance, rather than selecting relaxation training for general anxiety, a clinician may elect to choose cognitive-based treatment for COVID-19-related content. Using the FCV-19S would help provide the specific information for clinical decision making of this kind.

The results of the present study also illuminate additional aspects of the predictors of COVID-19 anxiety. First, gender and age were not associated with differing levels of anxiety as measured by the FCV-19S. Nor was experiencing financial loss from COVID-19. Knowing someone with COVID-19 symptoms, on the other hand, was associated with greater anxiety among this student population. This may be due to the increased salience that may occur from encountering COVID-19 in one's own circle of acquaintances. Married students were more likely to be anxious than those who are not married. The reasons for this are not clear, but it is possible that married participants have more anxiety in that they worry not only about themselves, but for their partner's welfare also.

In this group, ethnicity was only associated with fear of COVID-19 for one group. Students of Asian descent scored higher than did Caucasians on the anxiety measure. Our data do not provide specific conclusive reasons to explain this finding. There is, however, a recent rise in anti-Asian racism associated with the putative origins of COVID-19 (Chung and Li 2020; Human Rights Watch 2020; Lin 2020). It is possible, thus, that an increasing climate of anti-Asian racism may be responsible for increased anxiety related to this topic in students of Asian descent. This is an open question which merits additional research.

These results come with limitations. Given that our population has strong representation of US ethnic minorities (70% non-Caucasian) and is somewhat older than traditional university samples (55% over the age of 25), it is not clear how this sample would generalize to all US university students. Given that this was a sample of a college population, it would also be useful to replicate on non-college populations.

This was a cross-sectional study which does not provide information about the effects of time or history on COVID-19-related anxiety. As the pandemic and its social impacts develop, changes in social rules and norms result. Public health information evolves, and trust in various information sources may wax and wane as well. Longitudinal study of the FCV-19S would provide important information about how COVID-19-related anxiety changes with changing rates of infection and deaths as well as cultural and social responses to the pandemic. Understanding the long-term relationships between aspects of the pandemic, both medical and social, and resulting anxiety levels would be a fruitful and important course of research.

Compliance with Ethical Standards

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